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TECHNICAL REPORT SUMMARIES

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## INTRODUCTION

The Air Force Office of Scientific Research Technical Report Summaries is published quarterly (March, June, September, and December). It contains a brief summary of each technical report received in the Technical Information Division, and submitted to the Defense Technical Information Center (DTIC) for that quarter. Two indexes, subject and personal author are provided to help the user locate reports that may be of interest.

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## PURPOSE

The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting.

## AFOSR MISSION

The Air Force Office of Scientific Research (AFOSR) is the Single Manager of the Air Force Defense Research Sciences Program (Program Element 61102F) and the primary Air Force agency for the extramural support of fundamental scientific research. The AFOSR is organized under the Air Force Systems Command, DCS/Technology.

AFOSR awards grants and contracts for research in areas of science relevant to the needs of the Air Force. Research is selected for support from proposals received in response to the Broad Agency Announcement originating from scientists investigating problems involving the search for new knowledge and the expansion of scientific principles. Selection is on the basis of scientific potential for improving Air Force operational capabilities, originality, significance to science, the qualification of the principal investigators, and the reasonableness of the proposed budget.



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Field & Group Numbers - (appearing after the AD number) First number is the subject field, and the second number is the particular group under that subject field.

Corporate Author/Performing Organization - The organization; e.g., college/university, company, etc., at which the research is conducted.

Title - The title of the technical report.

Descriptive Note - Gives the type of report; e.g., final, interim, etc., and the period of the time of the research.

Date - Date of the technical report.

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Personal Author - Person or persons who wrote the report.

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Project Number - A number unique to a particular area of science; e.g., 2304 is the project number for mathematics.

**Task Number** - An alphanumeric number unique to a specific field of the main area of science; e.g., 2304 is the project number for mathematics and A3 is the task number for computational sciences.

**Monitor Number** - The number assigned to a particular report by the government agency monitoring the research. The number consists of the government monitor acronym, the present calendar year and the technical report assigned consecutively; e.g., AFOSR-TR-83-0001 is the first number used for the first technical report processed for Calendar Year 1983.

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sigma': eta(5)-  
C5H4)2(CO)4(HB(Pz)3)2) (HB(pz)3 =  
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Complex Derived from a  
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 CC5H4)2(CO)4(HB(Pz)3)2 (HB(pz)3 =  
 Hydrotris(pyrazol-1,1-vl)Norate): A  
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\* \* \*

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ZEWAIL, AHMED H \* \* \*

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AD-A217 062 \* \* \*  
\*ZHAO, MING-TANG \* \* \*  
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AD-A216 824 \* \* \*  
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AD-A217 753 \* \* \*  
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# *ABSTRACTS*

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO EVJ20M

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.HOECHST CELANESE CORP SUMMIT NJ RESEARCH DIV

DOW CORNING CORP MIDLAND MI

(U) Nonlinear Optical Properties of Polymers.

(U) Surface Protected Electronic Circuits Research.

DESCRIPTIVE NOTE: Final rept. Sep 87-Mar 89.

DESCRIPTIVE NOTE: Final technical rept. 15 Aug 86-14 Sep 89,

APR 89 59P

JAN 90 220P

PERSONAL AUTHORS: Allen, D.; DeMartino, R.; Feuer, B.; Haas, D.; Khanarian, G.

PERSONAL AUTHORS: Snow, Sarah S.; Chandra, Grish

CONTRACT NO. F49620-87-C-01115

CONTRACT NO. F49620-86-C-0110, ARPA Order-9107

PROJECT NO. 2303

PROJECT NO. 6387

TASK NO. A3

TASK NO. 01

MONITOR: AFOSR  
TR-90-0234

MONITOR: AFOSR  
TR-90-0239

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Distribution: Further dissemination only as directed by AFOSR/NC, Building 410, Bolling AFB, DC 20332-6448, 27 Feb 90, or higher DoD authority.

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*POLYMERS, CHAINS, COPOLYMERS, ELECTROOPTICS, FIGURE OF MERIT, METHACRYLATES, MODULATORS, NONLINEAR SYSTEMS, OPTICS, SIDES, SPACERS.

DESCRIPTORS: (U) \*CIRCUITS, \*COATINGS, \*GALLIUM ARSENIDES, \*SILICONES, \*INORGANIC MATERIALS, \*INTEGRATED CIRCUITS, IMPACT, LAYERS, LOW TEMPERATURE, PROCESSING.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3.

IDENTIFIERS: (U) PE62712E, WUAFOSR638701.

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ROCKWELL INTERNATIONAL CANOGA PARK CA ROCKETDYNE DIV

DESCRIPTORS: (U) \*NITROMETHANE, \*OXIDIZERS, \*ROCKET  
 PROPELLANTS, ATOMS, BURNING RATE, CARBONATES, CHEMISTRY,  
 COMBUSTION, DECOMPOSITION, ENERGETIC PROPERTIES, ENERGY,  
 ESTERS, HEATING, HIGH RATE, MATERIALS, MATRICES(CIRCUITS),  
 NITRAMINES, NITROGEN COMPOUNDS, POLYMERS, PYROLYSIS,  
 REACTION KINETICS, MOLECULAR STRUCTURE, SUBSTITUTION  
 REACTIONS, NITRO RADICALS, UREA, VARIATIONS.

(U) Basic Research in the Chemistry and Combustion of  
 Nitroform Compounds.

DESCRIPTIVE NOTE: Final rept. 15 Mar 86-31 Jul 89.

NOV 89

PERSONAL AUTHORS: Flanagan, J. E.; Woolery, D. O.; Weber,  
 J. F.; Frankel, M. B.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2308A1, \*Nitroform,  
 Trinitromethane.

REPORT NO. RI/RD89-256

CONTRACT NO. F49620-86-C-0017

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
 TR-90-0083

## UNCLASSIFIED REPORT

Distribution authorized to DoD and DoD contractors only;  
 Critical Technology: Aug 89. Other requests shall be  
 referred to AFRPL/TSTR, Edwards AFB, CA 93523.

ABSTRACT: (U) A three year basic research program was  
 carried out to determine the factors which affect the  
 performance of oxidizers derived from nitroform  
 (trinitromethane). The parameters evaluated included: the  
 rate and energy of decomposition of the neat oxidizer  
 candidates; the products of pyrolysis at high heating  
 rates and varying pressures; the burning rates of the  
 neat oxidizers and the oxidizers in polymeric matrices,  
 and the effects of structural variation, via substitution  
 of nitro groups for other nonenergetic groups and atoms;  
 and combining the energetic moieties by a variety of  
 energetic and nonenergetic linkages commonly found in  
 propellant materials. The oxidizer candidates included  
 compounds containing trinitromethyl, fluorodinitromethyl,  
 chlorodinitromethyl, and dinitromethylene groups with  
 linkages such as those found in formals, carbonates,  
 orthoesters, ureas, nitramines, and esters. Keywords:  
 Reaction kinetics; Combustion. (aw)

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TENNESSEE UNIV KNOXVILLE DEPT OF MATHEMATICS

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MATHEMATICS

(U) Efficient Numerical Methods for Evolution Partial  
Differential Equations.

(U) Numerical Conformal Mapping and Applications.

DESCRIPTIVE NOTE: Final rept. 1 Oct 87-30 Sep 89,

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 86-30 Nov  
89,

SEP 89

5P

FEB 90

19P

PERSONAL AUTHORS: Karakashian, Lhannes

PERSONAL AUTHORS: Trefethen, Lloyd N.

CONTRACT NO. AFOSR-88-0019

CONTRACT NO. AFOSR-87-0102

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR  
TR-90-0334

MONITOR: AFOSR  
TR-90-0356

UNCLASSIFIED REPORT

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ABSTRACT: (U) The convergence estimates obtained for the Korteweg-de Vries equation have been generalized, under the assumption that the solution  $u$  is sufficiently regular. For  $p \geq 4$ , it is not known whether a global smooth solution exists corresponding to smooth initial data. It is in fact conjectured that for these cases, the solution may develop a singularity in finite time. A code that uses a spatially and temporally adaptive strategy has been implemented. We are currently investigating the stability of solitary type solutions. As conjectured, these solutions are highly unstable for initial amplitudes larger than one. (KR)

DESCRIPTORS: (U) \*NUMERICAL METHODS AND PROCEDURES, \*PARTIAL DIFFERENTIAL EQUATIONS, ADAPTIVE SYSTEMS, CONVERGENCE, EFFICIENCY, ESTIMATES, EVOLUTION(GENERAL), GLOBAL, SOLUTIONS(GENERAL), STRATEGY, STABILITY, TIME.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, Korteweg deVries equation.

ABSTRACT: (U) During the period covered by the grant, ten papers were written. Titles include Error Bounds for Newton Refinement of Solutions to Algebraic Riccati Equations, Computable Bounds for the Sensitivity of Algebraic Riccati Equations, and Estimating the Distance to the Nearest Uncontrollable Pair through the Algebraic Riccati Equation. (KR)

DESCRIPTORS: (U) \*CONFORMAL MAPPING, \*RICCATI EQUATION, ALGEBRA, CONTROL, EQUATIONS, NUMERICAL ANALYSIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3.

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OKLAHOMA STATE UNIV STILLWATER DEPT OF PHYSICS

(U) Photorefractive Damage Mechanisms in Electro-Optic Materials.

DESCRIPTIVE NOTE: Final rept. Jul 85-Mar 89.

JAN 90 54P

PERSONAL AUTHORS: Halliburton, Larry E.

CONTRACT NO. AFOSR-85-0270

PROJECT NO. 2305

TASK NO. B1

MONITOR: AFOSR  
TR-80-0337

UNCLASSIFIED REPORT

ABSTRACT: (U) Point defects in lithium niobate and related electro-optic materials have been characterized using electron paramagnetic resonance (EPR), optical absorption, thermally stimulated luminescence, and a radiation-induced trapped-hole center. This new  $S = 1/2$  defect is stable at 77 K but thermally decays near 150 K. Its EPR spectrum exhibits a complex hyperfine equally with three  $^{93}\text{Nb}$  nuclei. We suggest that the hole is equally shared by a set of three equivalent oxygen ions adjacent to a cation vacancy. The photo-induced redistribution of charge has been characterized in  $\text{B}112\text{GeO}_{20}$  and  $\text{B}112\text{SiO}_{20}$  crystals. Optical excitation at 77 K converts  $\text{Fe}^{3+}$  ions to  $\text{Fe}^{2+}$  ions. The source of electrons (i.e., the hole traps) may be other impurities or intrinsic defects such as vacancies or anti-site cations. The intrinsic defects such as vacancies or anti-site cations. The  $\text{Fe}^{3+}$  recovery during warming correlates with thermoluminescence peaks at 145, 165, and 245 K. Our results suggest that  $\text{Fe}^{3+}$  ions may play an important role in the photorefractive effect in these materials. In  $\text{LiTaO}_3$ , the EPR spectrum of  $\text{Ta}^{4+}$  ions have been investigated. The diffusion coefficients of deuterium in single crystals of  $\text{LiTaO}_3$  have been measured by monitoring the growth of OD (-) infrared absorption bands. (AW)

DESCRIPTORS: (U) \*ABSORPTION SPECTRA, \*ELECTROOPTICS, \*OPTICAL MATERIALS, \*POINT DEFECTS, \*REFRACTION, ABSORPTION, BAND SPECTRA, DEUTERIUM, DIFFUSION COEFFICIENT, ELECTRON PARAMAGNETIC RESONANCE, ELECTRONS, EXCITATION, HEATING, IMPURITIES, INFRARED SPECTRA, CATIONS, LITHIUM NIOBATES, NUCLEI, OPTICAL PROPERTIES, OXYGEN, SOURCES, HOLES(ELECTRON DEFICIENCIES), VACANCIES(CRYSTAL DEFECTS), ELECTRIC CHARGE, DISTRIBUTION, BISMUTH, GERMANIUM COMPOUNDS, DIOXIDES, SILICON DIOXIDE, IRON, LUMINESCENCE, TANTALUM COMPOUNDS, LITHIUM COMPOUNDS, OXIDES.

IDENTIFIERS: (U) PE61102F, WJAFOSR2305B1.

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
CHEMISTRY

CALIFORNIA UNIV LOS ANGELES COGNITIVE SYSTEMS LAB

(U) Informal Photochemistry Conference (XVIIth).

DESCRIPTIVE NOTE: Final rept. 1 Sep 88-30 Aug 89,

FEB 90

23P

PERSONAL AUTHORS: Wittig, Curt; Reisler, Hanna

CONTRACT NO. AFOSR-88-0289

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-90-0331

## UNCLASSIFIED REPORT

ABSTRACT: (U) The Eighteenth Informal Conference on Photochemistry took place in Santa Monica, California, January 9-13, 1989, at the BayView Plaza Hotel. Traditionally informal conferences reflect the interests of the hosting institution, and the XVIIth Conference has emphasized photodissociation dynamics. There were 28 invited speakers from the U.S. and Europe, a total of approx. 40 oral presentations and approx. 80 poster presentations. There were about 200 participants. Keywords: Conference reports; Photochemistry; Photodissociation dynamics. (UG)

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*SYMPOSIA, CALIFORNIA, DYNAMICS, EUROPE, PHOTODISSOCIATION, REPORTS.

IDENTIFIERS: (U) WUAFOSR230381, PE61102F.

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(U) Dynamic Constraints Networks.

DESCRIPTIVE NOTE: Final rept. 1 May 88-31 Oct 89,

OCT 89

4P

PERSONAL AUTHORS: Pearl, Judea

CONTRACT NO. AFOSR-88-0177

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-90-0344

## UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this effort was to develop a comprehensive and efficient model of dynamic constraint networks. The current available systems are either too complicated to understand of quite limited. The are not based on well understood theories. Their capabilities and boundaries are not formally assessed. This prevents comparison of different approaches which is essential in a process of developing and improving a model. A theory based on static approach and constrained networks has been used to develop a dynamic theory of constraint networks for problem solving. The scientific results of this development resulted in six scientific publications. Keywords: Algorithms; Constraints networks. (KT)

DESCRIPTORS: (U) \*ALGORITHMS, \*PROBLEM SOLVING, DYNAMICS, EFFICIENCY, MODELS, NETWORKS, SCIENTIFIC LITERATURE, STATICS, THEORY.

IDENTIFIERS: (U) WUAFOSR2304A7, PE61102F, \*Dynamic Constraint Networks, Constraint Networks.

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AD-A219 723 CONTINUED

SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING  
ITHACA NY

(U) A Diffusion Model for Velocity Gradients in Turbulence.

FEB 90 17P

PERSONAL AUTHORS: Girimaji, S. S.; Pope, S. B.

CONTRACT NO. AFOSR-88-0052

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0300

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physics of Fluids A, Fluid Dynamics, v2 n2 p242-256 Feb 90.

ABSTRACT: (U) A stochastic model for velocity gradients following fluid particles in incompressible, homogeneous, and isotropic turbulence is presented and demonstrated. The model is constructed so that the velocity gradients satisfy the incompressibility and isotropy requirements exactly. It is further constrained to yield the first few moments of the velocity gradient distribution similar to those computed from full turbulence simulations (FTS) data. The performance of the model is then compared with other computations from FTS data. The model gives good agreement of one-time statistics. While the two-time statistics of strain rate are well replicated, the two-time vorticity statistics are not as good, reflecting perhaps a certain lack of embodiment of physics in the model. The performance of the model when used to compute material element deformation is qualitatively good, with the material line-element growth rate being correct to within 5% and that of surface element correct to within 20% for the lowest Reynolds number considered. The performance of the model is uniformly good for all the Reynolds numbers considered. So it is conjectured that the model can be used even in inhomogeneous, high-Reynolds-number flows, for the study of evolution of surfaces, a problem that is of interest particularly to combustion researchers. Reprints. (jhd)

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DESCRIPTORS: (U) \*INCOMPRESSIBLE FLOW, \*TURBULENCE, COMBUSTION, COMPUTATIONS, DEFORMATION, DIFFUSION, DISTRIBUTION, GRADIENTS, ISOTROPISM, MATERIALS, MATHEMATICAL MODELS, MOMENTS, REPRINTS, REYNOLDS NUMBER, SIMULATION, STOCHASTIC PROCESSES, STRAIN RATE, VELOCITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A219 715 7/4 20/5

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

(U) On the Electronic Structure of the NH Radical. The Fine Structure Splitting the  $X(3)\Sigma(-)$  State and the Spin-Forbidden  $(\beta(1)\Sigma(+))$ ,  $\alpha(1)\Delta$  Yields  $X(3)\Sigma(-)$ , and the Spin-Allowed  $A(3)\Pi$  Yields  $X(3)\Sigma(-)$  and  $C(1)\Pi$  Yields  $(\beta(1)\Sigma(+))$   $\alpha(1)\Delta$ , Radiative Transitions.

DESCRIPTORS: (U) \*ELECTRONIC STATES, \*SPLITTING, \*ELECTRON TRANSITIONS, \*IMIDES, \*CHEMICAL RADICALS, CONFIGURATIONS, DECAY, DIPOLES, FUNCTIONS, MATRIX THEORY, MICROSCOPY, OPTICAL EQUIPMENT, MOLECULAR ORBITALS, PERTURBATION THEORY, PROBES, RADIATIVE TRANSFER, RATES, MOLECULAR ROTATION, SPIN STATES, VALUE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, \*Imidogen Radical, Radiative Transitions.

OCT 89 15P

PERSONAL AUTHORS: Yarkony, David R.

CONTRACT NO. AFOSR-86-0110

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0127

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v91 n8 p4745-4757, 15 Oct 89.

ABSTRACT: (U) In this work the fine structure splitting of the  $X(3)\Sigma(-)$  state of NH together with the spin-forbidden dipole-allowed radiative transitions  $b(1)\Sigma(+)$ ,  $a(1)\Delta$  yields  $X(3)\Sigma(-)$  in that system are considered. In addition the spin-allowed  $A(3)\Pi$  yields  $X(3)\Sigma(-)$  and  $C(1)\Pi$  yields  $b(1)\Sigma(+)$ ,  $a(1)\Delta$  transitions which provide valuable optical probes of the Imidogen (NH) radical are studied. Symbolic matrix methods permit the use of large configuration state function (CSF) spaces ( $170-280 \times 1,000$  CSF's) in characterizing these effects. The fine structure splitting and spin-forbidden decay are described within the context of the Breit-Pauli approximation. In the determination of the fine structure splitting both  $H(0)$ , the full microscopic spin-orbit and spin-other-orbit operator and  $H(2)$ , the dipolar spin-spin operator, are considered through second order in perturbation theory. The predicted radiative rate for the  $v=0$  level of the  $C(1)\Pi$  state is somewhat slower than the total decay rate measured experimentally suggesting predissociation of even the lowest rotational levels. (AW)

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COLUMBIA UNIV NEW YORK LOWELL MEMORIAL LIBRARY

(U) Photoinduced Electron-Transfer Reactions to Probe the Structure of Starburst Dendrimers.

COMPUTATIONS, METAL COMPLEXES, PARTICLES, PROBES, QUENCHING, REPRINTS, RUTHENIUM, SHAPE, STRUCTURES, SURFACES, SYNTHESIS(CHEMISTRY), THEORY, TRANSITIONS, VARIATIONS.

DESCRIPTIVE NOTE: Scientific rept. 1988-89.

90 4P

IDENTIFIERS: (U) Dendrimers, Starburst dendrimers, Micellar structures, Carboxylate terminated starburst dendrimers, Photoinduced reactions, PE61102F, WUAFOSR2303B2.

PERSONAL AUTHORS: Moreno-Bondi, Maria; Orellana, Guillermo; Turro, N. J.; Tomalia, Donald A.

CONTRACT NO. AFOSR-90-0049

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-90-0319

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v23 p910-912 1990.

ABSTRACT: (U) The so-called starburst dendrimers, a new class of compounds possessing unique structural and topological features, have recently been introduced by Tomalia and coworkers. Controlled branching reactions from an initiator core allow for the synthesis of particles with various types of surface groups that might be successfully compared to micellar structures without their dynamic structure. The photoinduced electron transfers between species adsorbed on the carboxylate-terminated starburst dendrimers demonstrate that a change in dendrimer structural features occurs about generation 3.5, in agreement with the shape transition predicted on the basis of theoretical calculations. Future studies will characterize further these electron-transfer reactions in a well-defined microenvironment of reduced dimensionality, through a systematic variation of the ruthenium probes and the cationic quenchers bound to the different starburst polymers. Keywords: Electron transfer; Ruthenium complexes; Polymers; Reprints. (EDC)

DESCRIPTORS: (U) \*ELECTRON TRANSFER, \*PHOTOCHEMICAL REACTIONS, \*POLYMERS, CARBOXYL GROUPS, CATIONS, COLLOIDS,

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ISOTOPES, LOW TEMPERATURE, REPRINTS, ROOM TEMPERATURE, SOLVENTS, SUBSTITUTION REACTIONS, TEMPERATURE, THERMAL PROPERTIES, TRANSIENTS, VISCOSITY.

(U) Combined Effect of Isotopic Substitution, Temperature, and Magnetic Field on the Lifetimes of Triplet Biradicals.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2,

\*Phenylcycloalkanes, \*Phenylcycloodecanones, Cycloalkanes, Cycloodecanones, Cycloalkane/2-Phenyl, Cycloodecane/2-Phenyl, Lifetime, Triplet State, \*Biradicals.

DESCRIPTIVE NOTE: Scientific rept. 1988-89,

90 4P

PERSONAL AUTHORS: Wang, Jin-Feng; Rao, V. P.; Doubleday, Charles, Jr; Turro, Nicholas J.

CONTRACT NO. AFOSR-90-0049

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0321

## UNCLASSIFIED REPORT

ABSTRACT: (U) Lifetimes tau for decay of triplet biradicals derived from 2-phenylcycloalkanes were measured by nanosecond transient absorption under conditions designed to probe the contribution of intersystem crossing and chain dynamics to the observed decay. The temperature dependence of tau was measured at both 0 and 2kG magnetic field, and also in the presence of 0.004 M manganous chloride. Under a variety of conditions of temperature, solvent viscosity, and magnetic field, the lifetime of the biradical derived from 2-phenylcycloodecanone was compared with its perdeuterated analogue and with a 1:1 mixture of 1,2-(13)C2 and 1,12-(13)C2 isotopomers. The magnetic isotope effect on tau and the temperature dependence of Mn(2+) quenching support chain dynamics as the rate-limiting step at room temperature. However, the magnetic field effect on tau reaches a maximum around -50 C and persists even at -89 C, in contrast to the magnetic isotope effect and Mn(2+) quenching which are absent at low temperature. Reprints. (aw)

DESCRIPTORS: (U) \*ISOTOPE EFFECT, \*MAGNETIC FIELDS, \*CHEMICAL RADICALS, \*THERMOCHEMISTRY, \*CYCLOALKANES, \*DECAY, ABSORPTION, CHAIN REACTIONS, CHLORIDES, DYNAMICS,

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reaction, Reprints. (aw)

(U) Modification of Face Selectivity by Inclusion in Cyclodextrins.

DESCRIPTORS: (U) \*ADDITION REACTIONS, \*PHOTOCHEMICAL REACTIONS, \*STEREOCHEMISTRY, \*DEXTRINS, \*CYCLIC COMPOUNDS, ACETONITRILE, COOLING, DELIVERY, HYDRIDES, IRRADIATION, KETONES, ORGANIC SOLVENTS, RATIOS, REDUCTION(CHEMISTRY), REPRINTS, SODIUM BOROHYDRIDES, SOLUTIONS(MIXTURES), THERMOCHEMISTRY, WATER, ADAMANTANES, HALIDES, HYDROXYL RADICALS, PHOSPHORUS.

DESCRIPTIVE NOTE: Scientific rept. 1988-89,

90 5P

PERSONAL AUTHORS: Chung, Wen-Sheng; Turro, N. J.; Silver, J.; Lenoble, W. J.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382, \*Cyclodextrins.

CONTRACT NO. AFOSR-90-0049

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0320

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v112 p1202-1205 1990.

ABSTRACT: (U) The photocycloadditions of 5-X-adamantan-2-ones (5-X-AD, where X = F, Cl, Br, OH, Ph, and t-Bu) with fumaronitrile have been studied in acetonitrile and in aqueous solutions. When X is Cl, Br, Ph, or t-Bu, irradiation of an aqueous solution containing beta-cyclodextrin (beta-CD) leads to a dramatic reversal in face selectivity compared to that found in acetonitrile and water; however, there is no significant change in product ratio compared to that found in aqueous solution in the presence of alpha- and gamma-CD. The effect observed with beta-CD is interpreted with the assumption that the carbonyl pi face syn to the bulky 5-substituent is partially blocked by the torus of the host due to complexation of the AD and CD. NMR and concentration dependence studies provide support for this interpretation. Similar reversals of face selectivity upon complexation with beta-CD are observed in the thermal reduction of these ketones by sodium borohydride. It is also noted that a much enhanced syn hydride delivery occurs in water as compared to organic solvents and that this enhancement vanishes upon cooling. Keywords: Photochemical reactions, Stereochemistry, Addition

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TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

CONNECTICUT UNIV STORRS DEPT OF ELECTRICAL AND SYSTEMS  
ENGINEERING

(U) The Effect of Sampling on Linear Equivalence and  
Feedback Linearization.

(U) Stochastic Adaptive Control and Estimation Enhancement.

DESCRIPTIVE NOTE: Final rept..

89 10P

PERSONAL AUTHORS: Arapostathis, A.; Jakubczyk, B.; Lee, H.  
G.; Marcus, S. I.; Sontag, E. D.

FEB 90 89P

PERSONAL AUTHORS: Bar-Shalom, Y.

CONTRACT NO. AFOSR-88-0029

CONTRACT NO. AFOSR-88-0202

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-90-0318

MONITOR: AFOSR  
TR-90-0303

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Systems and Control Letters,  
v13 p373-381 1989.

ABSTRACT: (U) The effect is investigated for sampling on  
linearization for continuous time systems. The  
discretized system is linearizable by state coordinate  
change for an open set of sampling times if and only if  
the continuous time system is linearizable by state  
coordinate change. Also, it is shown that linearizability  
via digital feedback impose highly nongeneric constraints  
on the structure of the plant, even if this is known to  
be linearizable with continuous-time feedback. For  $n=2$ ,  
under the assumption of completeness of  $\text{ad}(\text{sub } F)G$ , that  
if the discretized system is linearizable by state  
coordinate change and feedback, then the continuous time  
affine complete analytic system is linearizable by state  
coordinate change only. Also, a method of proof when  $n >$   
or  $= 3$  is suggested. Reprints. (JHD)

DESCRIPTORS: (U) \*FEEDBACK, \*SAMPLING, COORDINATES,  
DIGITAL SYSTEMS, LINEARITY, REPRINTS, TIME.

IDENTIFIERS: (U) Linear Equivalence, PES1102F,  
WUAFOSR2304A1.

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ABSTRACT: (U) The investigations summarized in this  
report deal with: 1) adaptive dual control of systems  
with unknown parameters; 2) estimation and control of  
hybrid stochastic systems; 3) distributed estimation in  
systems with measurements of uncertain origin; 4)  
solution of continuous-time hybrid stochastic  
differential equations; and 5) of point process theory  
for target mode estimation. The report consists primarily  
of 10 preprints and reprints. Keywords: Adaptive/  
stochastic control.

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, \*STOCHASTIC  
CONTROL, DISTRIBUTION, ESTIMATES, HYBRID SYSTEMS,  
OPTIMIZATION, REPRINTS, STOCHASTIC PROCESSES, TARGETS,  
THEORY.

IDENTIFIERS: (U) PES1102F, WUAFOSR2304A1.



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NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

INDIANA UNIV AT BLOOMINGTON HEARING AND COMMUNICATION LAB

(U) Center for Analysis of Heterogeneous and Nonlinear Media.

(U) Perception of Complex Auditory Patterns.

DESCRIPTIVE NOTE: Final rept. 15 Sep 86-14 Oct 89.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-30 Sep 89.

OCT 89 87P

NOV 89 21P

PERSONAL AUTHORS: Cafllisch, Russell E.

PERSONAL AUTHORS: Watson, Charles S.; Kidd, Gary R.

CONTRACT NO. AFOSR-88-0352

CONTRACT NO. AFOSR-87-0300

PROJECT NO. 3484

PROJECT NO. 2313

TASK NO. A5

TASK NO. A6

MONITOR: AFOSR

MONITOR: AFOSR  
TR-90-0301

TR-90-0302

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The Center for Analysis of Heterogeneous and Nonlinear Media was established in October 1986 through the University Research Initiative (URI) Program. The scientific research of the Center has consisted of modeling, mathematical analysis and computation of problems in composite and random materials, nonlinear optics and fluid dynamics. The results of this research are presented in a number of research publications and several books. Two workshops, on vortex dynamics and on composite materials, were organized by the Center. The focus of the Center has been on the following research areas: Vortex dynamics in incompressible fluids; Numerical methods for fluid dynamics; Macroscopic properties of composite materials; Wave propagation in random media; and Nonlinear phenomena in optical materials. (AW)

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*FLUID DYNAMICS, \*OPTICAL MATERIALS, COMPUTATIONS, FLUIDS, HETEROGENEITY, INCOMPRESSIBLE FLOW, MATERIALS, MATHEMATICAL ANALYSIS, MEDIA, NONLINEAR SYSTEMS, NUMERICAL METHODS AND PROCEDURES, OPTICS, VORTICES, WAVE PROPAGATION, WORKSHOPS, RESEARCH MANAGEMENT.

IDENTIFIERS: (U) PE81102F, WUAFOSR3484A5.

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ABSTRACT: (U) This report describes the results of research in four areas: 1) the perception of complex sounds, including tonal sequences, multidimensional complex sounds, and Gaussian noise; 2) information integration; 3) multi-stage decision making; 4) studies of the relation between auditory abilities measured with speech and nonspeech stimuli. Major accomplishments during this funding period include: a) the discovery of the proportion-of-the-total-duration (PTD) principle: Each individual component of a complex sound is resolved with an accuracy that is a function of its proportion of the total duration of the sound; b) even small degrees of logarithmic frequency transposition of tonal patterns severely degrades the detectability of pattern changes in novel sequences, but not in familiar sequences c) temporal integration of auditory information is limited by two distinct types of internal noise, one that is added at the periphery before a decision statistic is formed, and 'central', or post-decision, noise; d) the development of a theory that incorporates these limiting factors; e) the completion and publication of studies of categorical perception for speech and non-speech sounds, demonstrating that enhanced discrimination performance in the region of certain categorical boundaries does not reflect either 'hard-wired' feature detectors in the auditory nervous system, nor psychoacoustic boundaries determined by acoustic peculiarities of complex waveforms.

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(aw)

TENNESSEE UNIV KNOXVILLE DEPT OF MATHEMATICS

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, \*PATTERN RECOGNITION, ACCURACY, AUDIO TONES, AUDITORY NERVE, AUDITORY SIGNALS, DETECTION, DISCRIMINATION, FREQUENCY, GAUSSIAN NOISE, HEARING, INTEGRATION, INTERNAL LIMITATIONS, LOGARITHM FUNCTIONS, NERVOUS SYSTEM, NOISE, PATTERNS, SEQUENCES, SKILLS, SOUND, SPEECH, TIME, WAVEFORMS, DECISION MAKING.

(U) Integral and Series Representation of Infinitely Divisible Processes with Applications to Their Prediction and to Their Sample Path, Statistical and Structural Properties.

DESCRIPTIVE NOTE: Final rept. 1 Apr 87-31 Jul 89,

JUL 89 13P

IDENTIFIERS: (U) PE81102F, WUAFOSR2313AB.

PERSONAL AUTHORS: Rajput, Balram S.; Rosinski, Jan

CONTRACT NO. AFOSR-87-0136

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0298

UNCLASSIFIED REPORT

ABSTRACT: (U) The Gaussian model has been used to describe many random phenomena in science and engineering because of its versatility and mathematical simplicity. However, the Gaussian model is not universally applicable; and, in fact, there are many instances, both in the areas of theoretical research and engineering applications, where the need of non-Gaussian models, particularly those with infinite variance, can be identified. For instance, man-made noise in a hostile environment can be made to depart from Gaussian behavior; and the natural noise occurring in situations where weak signals need to be extracted also tends to not follow the Gaussian pattern. These are but a few examples that might be of particular interest to defense agencies, where non-Gaussian modeling and their analysis are most desirable. Keywords: Gaussian models; Integral and series representation; Prediction; Sample path; Statistical and structural properties; Man-made noise; Statistical processes; White noise; Acoustics. (jg)

DESCRIPTORS: (U) \*ACOUSTICS, \*NOISE, \*STATISTICS, ENEMY, ENGINEERING, ENVIRONMENTS, LOW STRENGTH, MANMADE, MODELS, SIGNALS, STATISTICAL PROCESSES, STRUCTURAL PROPERTIES, VARIATIONS, WHITE NOISE.

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AD-A219 624 20/4

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL  
ENGINEERING

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

(U) Numerical Simulation of Turbulent Combustion Using  
Vortex Methods.

DESCRIPTIVE NOTE: Final rept. 1986-1989.

JAN 90 81P

PERSONAL AUTHORS: Ghoniem, Ahmed F.

CONTRACT NO. AFOSR-84-0356

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0283

UNCLASSIFIED REPORT

ABSTRACT: (U) During the course of this work, we have developed a new numerical method for the integration of the unaveraged, time-dependent, high-Reynolds number Navier-Stokes equations governing a reacting flow. This method, which we called the transport element, is a grid free Lagrangian field method which has been developed for the simulation of reacting flow, and to describe mechanisms of shear flow-combustion interaction which have been revealed using these methods. Reynolds number; Navier-stokes equation; Turbulent combustion; Vortex methods; Fluid mechanics; Numerical simulation; Lagrangian functions. (jg)

DESCRIPTORS: (U) \*COMBUSTION, \*FLUID MECHANICS, \*NUMERICAL METHODS AND PROCEDURES, \*SIMULATION, \*TURBULENCE, \*VORTICES, FLOW, GRIDS, INTERACTIONS, LAGRANGIAN FUNCTIONS, MATHEMATICAL MODELS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, REYNOLDS NUMBER, SHEAR PROPERTIES, TRANSPORT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

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STANFORD UNIV CA DEPT OF AERONAUTICS AND ASTRONAUTICS

CINCINNATI UNIV OH DEPT OF AEROSPACE ENGINEERING

(U) Modeling and Control of Flexible Vehicles in Space.

(U) Composite Reduced Navier Stokes Procedures for Flow Problems with Strong Pressure Interactions.

DESCRIPTIVE NOTE: Final rept. Oct 87-Oct 89,

DESCRIPTIVE NOTE: Final rept. 1 Feb 85-31 Oct 89,

FEB 90 48P

JAN 90 41P

PERSONAL AUTHORS: Bryson, A. E.; Wiesinger, F. A.

PERSONAL AUTHORS: Rubin, S. G.; Khosla, P. K.

CONTRACT NO. AFOSR-88-0015

CONTRACT NO. F49620-85-C-0027

PROJECT NO. 2302

PROJECT NO. 2307

TASK NO. B1

TASK NO. A1

MONITOR: AFOSR

TR-90-0299

MONITOR: AFOSR  
TR-90-0296

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Several Aspects of modeling and control of large space structures have been investigated. A FORTRAN computer program is included which transforms modal data from commercially available finite element codes for personal computers to the forms needed for control system design. Design of a low order controller for a circular flat plate space structure is investigated by utilizing geometric symmetry of the structure and the control system actuators and sensor to decouple the system into smaller, single input -single output subsystems. Modeling of circular flat plates, Conversion of modal data to transfer function form, Shape control of flat plate, Decoupling of high order systems via symmetry, Spacecraft. (jg)

DESCRIPTORS: (U) \*COMPUTER PROGRAMS, \*FORTRAN, \*SPACECRAFT, ACTUATORS, CIRCULAR, CODING, CONTROL, CONTROL SYSTEMS, FINITE ELEMENT ANALYSIS, FLAT PLATE MODELS, GEOMETRY, MICROCOMPUTERS, SHAPE, SYMMETRY, TRANSFER FUNCTIONS, VEHICLES.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303B1.

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ABSTRACT: (U) The Reduced Navier Stokes (RNS) formulation for viscous-inviscid interacting flows with significant upstream or 'elliptic' effects has been applied for transient flow over airfoils at incidence, and steady two and three dimensional flows over cavity, wing and afterbody configurations. The solution technique applies uniformly over the entire Mach number range and allows for shock-boundary layer interaction, and for moderate regions of axial and secondary flow recirculation. For two dimensional problems with recirculation, it has been demonstrated that for laminar flows there exists a critical Reynolds number, that is geometry dependent, above which the solution exhibits a breakdown. This occurs in the region of recirculation and very close to the reattachment point. This phenomena is grid dependent and can be missed with insufficiently refined grids or when artificial viscosity is introduced. It has been shown that the pressure-split RNS procedure is in fact a special form of flux-vector splitting that has very favorable properties for sharp shock capturing. A sparse matrix direct solver procedure has been applied for both two dimensional transient flows, and for three dimensional steady flows with the RNS flux-split strategy. A uni-directional or semi-coarsening multigrid procedure has been further developed for viscous interacting flows, where significant grid stretching is required in order to

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adequately evaluate both thin viscous layers and large inviscid regions, with and without shock interaction. Keywords: Reduced Navier Stokes; Three dimensional; Separation laminar flow breakdown; Direct solver; Multi grid; Fluid mechanics; Pressure interactions; Viscous-inviscid interacting flow. (jg)

DESCRIPTORS: (U) \*FLOW, \*FLUID MECHANICS, \*PRESSURE, \*NAVIER STOKES EQUATIONS, AFTERBODIES, AIRFOILS, CONFIGURATIONS, ELLIPSES, GRIDS, INTERACTIONS, INVISCID FLOW, LAMINAR FLOW, LAYERS, MACH NUMBER, RANGE (EXTREMES), RECIRCULATION, REGIONS, REYNOLDS NUMBER, SECONDARY FLOW, SHARPNESS, SHOCK, SOLUTIONS (GENERAL), SPARSE MATRIX, STEADY FLOW, THINNESS, THREE DIMENSIONAL FLOW, TRANSIENTS, VISCOSITY, VISCOUS FLOW, WINGS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A1.

DREXEL UNIV PHILADELPHIA PA

(U) MTS High Temperature Testing System.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-31 Sep 89,

JAN 90 5P

PERSONAL AUTHORS: Wang, A. S.; Barsoum, M.

CONTRACT NO. AFOSR-89-0122

PROJECT NO. 3842

TASK NO. A1

MONITOR: AFOSR  
TR-90-0284

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the MTS High Temperature Testing System which was funded by AFOSR under the DURIP Program and installed at Drexel University. This testing system is dedicated exclusively for basic studies on the micromechanics behaviors of fiber-reinforced ceramic matrix composites under extreme temperature conditions. Owing to its very high temperature capability and versatility to perform tests in several testing configurations, this equipment has casted a positive impact on current AFOSR and other DOD funded research programs on ceramic-matrix composites conducted at Drexel University. It is the intention of this research group and the University to continue further developing our high-temperature mechanics capacity for the next generation of composite materials. Keywords: MTS High temperature tester, Ceramic matrix composites, Micromechanics. (EG)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*COMPOSITE MATERIALS, \*FIBER REINFORCED COMPOSITES, \*HIGH TEMPERATURE, \*MATRIX MATERIALS, \*MECHANICS, \*TEST EQUIPMENT, BEHAVIOR, CAPACITY (QUANTITY), RESEARCH MANAGEMENT, TEMPERATURE, TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR3842A1.

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LEHIGH UNIV BETHLEHEM PA WHITAKER LAB

PITTSBURGH UNIV PA DEPT OF MATHEMATICS AND STATISTICS

(U) High Temperature Microhardness Tester.

(U) Computational Fluid Dynamics.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-30 Nov 89,

JAN 90 13P

JAN 90 38P

PERSONAL AUTHORS: Chan, Helen M.

PERSONAL AUTHORS: Hall, Charles A.; Porsching, Thomas A.

CONTRACT NO. AFOSR-89-0106

CONTRACT NO. AFOSR-88-0262

PROJECT NO. 2917

PROJECT NO. 2304

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR  
TR-90-0315MONITOR: AFOSR  
TR-90-0306

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Funds were obtained through the Defense University Research Instrumentation Program (DURIP) for the purchase of a hardness machine capable of indenting at elevated temperatures. The instrument selected was the Nikon High Temperature Microhardness Tester, Model QM. This apparatus has an operating range from room temperature to 1600 C, with loads varying from 0.5 to 10 Newtons. The instrument is now installed and fully operational. It represents a very valuable and convenient method of evaluating the indentation properties of ceramics at elevated temperatures. Although presently at a preliminary stage, the indentation creep studies look particularly promising as a means of studying the high temperature mechanical behavior. Microhardness tester, Indentation properties, Ceramic materials, Creep studies, DURIP, Model QM, High temperature. (Jg)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*HIGH TEMPERATURE, \*MICROHARDNESS, \*TEST EQUIPMENT, CREEP, MECHANICAL PROPERTIES, ROOM TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A3.

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ABSTRACT: (U) This research concerns projects of seven investigators at the University of Pittsburgh relating to the general area of computational fluid dynamics. Topics include the dual variable method, Differential Algebraic Equation, the reduced basis method, divergence free finite elements, diffusive-transport systems, and bifurcation phenomena. Short descriptions of these projects are included, along with references to published reports. Fluid mechanics; Numerical mathematics; Additive correction methods; Navier-Stokes difference equations; Divergence free subspaces; Differential algebraic equations; Bifurcation (Mathematics). (Jg)

DESCRIPTORS: (U) \*COMPUTATIONS, \*FLUID MECHANICS, ADDITIVES, ALGEBRA, CORRECTIONS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, FLUID DYNAMICS, MATHEMATICS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3.

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AD-A219 556 12/4

HARVARD UNIV CAMBRIDGE MA

(U) Adaptive Filtering and Control.

DESCRIPTIVE NOTE: Final rept. 1 Jul 88-30 Jun 89.

NOV 89 3P

PERSONAL AUTHORS: Brockett, R. W.

CONTRACT NO. AFOSR-88-0197

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-90-0307

UNCLASSIFIED REPORT

ABSTRACT: (U) We have developed algorithms which evolve in continuous time and which are capable of accomplishing a wide variety of computations of the type which can be used in making systems adaptive. Examples range from computations done by finite automata to differential equations which compute the eigenvalues of matrices. Keywords: Adaptive control, Linear programming, Continuous time dynamical systems. (kr)

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, \*ADAPTIVE FILTERS, ALGORITHMS, AUTOMATA, COMPUTATIONS, DIFFERENTIAL EQUATIONS, DYNAMICS, LINEAR PROGRAMMING, TIME.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1.

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SAN DIEGO STATE UNIV CA CENTER FOR RESEARCH IN  
MATHEMATICS AND SCIENCE EDUCATION

(U) Constraints on the Abstraction of Solutions.

89 10P

PERSONAL AUTHORS: Reed, Stephen K.

CONTRACT NO. AFOSR-89-0107, \$AFOSR-88-0008

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-90-0287

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Educational  
Psychology. v81 n4 p532-540 1989.

ABSTRACT: (U) Students in college algebra classes attempted to solve a series of three mixture problems and three distance problems and to match concepts between the first two problems in a series. The detailed comparison of two isomorphs did not result in the abstraction of a solution schema, as it was found to do by Gick and Holyoak (1983) for convergence problems. Attempts to promote abstraction by not allowing students to refer to a specific analogue (Experiment 2) and by providing information about corresponding concepts and principles (Experiment 3) were unsuccessful. These findings suggest that the bottom-up, similarity-based approaches encouraged by mapping concepts may need to be supplemented by top-down, principle-driven instruction. The abstraction of solutions is constrained by (1) the requirements to successfully compare two specific analogues (the bootstrapping constraint) and (2) the existence of subordinate concepts to describe the abstraction. Keywords: Performance human; Decision theory; Schema; Examples; Procedures; Analogs; Mathematics; Reprints; Categorization; Word problems; Problem solving. (KT)

DESCRIPTORS: (U) \*MATHEMATICS, \*PERFORMANCE(HUMAN),  
\*PROBLEM SOLVING, ALGEBRA, CONVERGENCE, DECISION THEORY.

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MAPPING, MIXTURES, RANGE(DISTANCE), REPRINTS, STUDENTS,  
UNIVERSITIES, WORDS(LANGUAGE).

OXFORD UNIV (UNITED KINGDOM) INORGANIC CHEMISTRY LAB

IDENTIFIERS: (U) PE61102F, WJAFOSR2313A4.

(U) New Materials for Electrochemical Cells.

DESCRIPTIVE NOTE: Final rept.,

DEC 81 5P

PERSONAL AUTHORS: Goodenough, John B.; Dickens, Peter G.

CONTRACT NO. AFOSR-77-3402

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-1781

UNCLASSIFIED REPORT

ABSTRACT: (U) Determination of the thermochemical, structural and basic electrochemical properties of mixed electronic/ionic conductors was successfully carried out on the following systems: H(x)MoO3, Li(x)MoO3, H(x)WO3, and Li(x)MoO3. Attempts to design new protonic and Li(+) ion conductors have opened up two fields: One is the recognition of particle hydrates as protonic electrolytes capable of fabrication into dense ceramics by cold pressing; we have obtained room-temperature H(+) ion conductivity approaching .01/ohm/cm in cold-pressing Sb(2O(5.5).4H2O. The other is the use of low-temperature chemical and electrochemical techniques to prepare new materials not attainable with high-temperature techniques. With this method we have prepared Li/Li (1-x) Cobalt dioxide cells having open-circuit voltages in excess of 4 V. We have also initiated studies into composite electrolyte/electrode materials using room-temperature molten salts immobilized by insertion-compound electrode materials. (AW)

DESCRIPTORS: (U) \*CHEMICAL ENGINEERING, \*ELECTRODES, \*ELECTROLYTES, \*LITHIUM COMPOUNDS, \*HYDROGEN COMPOUNDS, ELECTROLYTIC CELLS, CERAMIC MATERIALS, CIRCUITS, COBALT, COMPOSITE MATERIALS, DIOXIDES, ELECTRIC CONDUCTORS, ELECTROCHEMISTRY, ELECTRONICS, HIGH DENSITY, HIGH TEMPERATURE, HYDRATES, IONIC CURRENT, LOW TEMPERATURE, MIXING, MOLTEN SALTS, PARTICLES, PRESSING(FORMING),

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RECOGNITION, ROOM TEMPERATURE, VOLTAGE, CATIONS, PROTONS.

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

IDENTIFIERS: (U) PE61102F, WUAF0SR2303A1.

(U) Existence Theorems for Measures on Continuous Posets, with Applications to Random Set Theory.

89 39P

PERSONAL AUTHORS: Norberg, T.

REPORT NO. TR-148

CONTRACT NO. F49628-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0279

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Mathematica Scandinavica v64 p15-51 1989.

ABSTRACT: (U) We state conditions on a partially ordered set (poset)  $L$  and a mapping  $\lambda$ , defined on a class  $\mathcal{F}$  of filters on  $L$ , under which  $\lambda$  extends to a measure on the minimal sigma-field over  $\mathcal{F}$ . By applying this extension result to the case when  $L$  is a continuous lattice, all locally finite measures on  $L$  are identified as well as all Levy-Khinchin measures. We then characterize these kinds of measures on continuous (inf-) semilattices and continuous posets. An interesting correspondence between Levy-Khinchin measures and infinitely divisible probability measures is presented. The correspondence between probability measures on the line and distribution functions is a particular case of this result. So is also Choquet's characterization of the distributions of all random closed sets in a fixed locally compact second countable Hausdorff space  $S$ . Our approach to Choquet's theorem show that it holds as soon as the topology of  $S$  is continuous, second countable and sober. Our method also yields characterizations of the distributions of all random compact and all random compact convex sets in  $R$  sub  $d$  for finite  $d$ . We furthermore obtain characterizations of infinite

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divisibility under union and sup, resp. for these kinds of random sets. Keywords: Reprints. (kr)

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

DESCRIPTORS: (U) \*MEASURE THEORY, \*MATHEMATICAL FILTERS, DISTRIBUTION FUNCTIONS, FILTERS, REPRINTS, THEORY, TOPOLOGY, MATHEMATICS.

(U) Stochastic Processes as Fourier Integrals and Dilation of Vector Measures,

OCT 89 7P

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, POSSETS(Partially Ordered Set).

PERSONAL AUTHORS: Houdre, C.

REPORT NO. TR-248

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0275

UNCLASSIFIED REPORT

ABSTRACT: (U) In this note we give an overview of some recent advances in representations of stochastic processes as Fourier integrals. These advances provide a Plancherel and a Hausdorff-Young theory for stochastic processes and random measures which were not previously available. We expect several applications of these methods, two of which are: existence results for linear stochastic differential equations (see Theorem 6) and a framework in which to develop a Fourier theory for the ubiquitous white noise model. Reprints. (KT)

DESCRIPTORS: (U) \*FOURIER ANALYSIS, \*LINEAR DIFFERENTIAL EQUATIONS, \*VECTOR ANALYSIS, \*STOCHASTIC PROCESSES, INTEGRALS, MODELS, REPRINTS, THEORY, WHITE NOISE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, \*Fourier integrals, Vector measures.

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CALIFORNIA UNIV SAN DIEGO LA JOLLA

YORK UNIV NORTH YORK (ONTARIO)

(U) An Optical Fiber Wavelength Standard for Pinon Flat Observatory.

(U) Visual Sensitivities and Discriminations and Their Role in Aviation.

DESCRIPTIVE NOTE: Final rept. 15 Jul 84-14 Nov 85,

DESCRIPTIVE NOTE: Interim rept. 1 Nov 88-30 Oct 89,

NOV 85 2P

OCT 89 67P

PERSONAL AUTHORS: Zumberge, Mark A.

PERSONAL AUTHORS: Regan, David

CONTRACT NO. AFOSR-84-0247

CONTRACT NO. F49620-88-C-0002

PROJECT NO. 2309

PROJECT NO. 2313

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR  
TR-87-0587

MONITOR: AFOSR  
TR-90-0235

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) An atomic wavelength standard has been acquired and a single-mode optical fiber network fabricated for the Pinon Flat Geophysical Observatory. These enhancements have greatly increased the precision of this unique facility.

ABSTRACT: (U) (1) Selective 'blindness' to approaching or receding motion in depth exists and seems to be not uncommon in normally-sighted individuals. (2) A perfectly camouflaged bar within a random dot pattern was rendered visible by moving dots within the bar and outside the bar with equal and opposite velocities. (3) Shape discrimination was compared for motion-defined and contrast-defined dotted rectangles. At high dot speeds and contrasts aspect ratio discrimination equal for the two kinds of rectangle and, at 2-3%, corresponded to a change of side length of only 24 arc sec. (4) Orientation discrimination and shape discrimination degrade more rapidly at short presentation durations for a motion-defined than for a contrast-defined target. (5) The findings in (2)-(4) above suggest that helicopter pilots may be at risk of making visual judgement errors in nap of the earth flight where some objects and ground features are seen by motion alone when contrast or speed is low or when inspection duration is brief. (6) We have developed a simple portable test for assessing visual ability to see and discriminate motion-defined form. (7) the motion-defined letter test was used on 25 patients with multiple sclerosis and 50 controls; 34/50 eyes of patients were abnormal even though visual acuity was normal. (8) Nonlinear systems analysis: We have developed a new mathematical approach to testing multi-neuron

DESCRIPTORS: (U) \*FIBER OPTICS, \*OBSERVATORIES, FREQUENCY, GEOPHYSICS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2309A1.

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models in which individual's neurons are modelled as rectifiers. (9) We have developed a nondestructive zoom-FFT technique that allows spectra of EEG and other time series to be computed with the theoretical resolution. (sdw)

DESCRIPTORS: (U) \*CAMOUFLAGE, \*DISCRIMINATION, \*VISUAL PERCEPTION, ASPECT RATIO, EARTH(PLANET), ELECTROENCEPHALOGRAPHY, FLIGHT, HELICOPTERS, INSPECTION, LENGTH, MATHEMATICS, NONLINEAR ANALYSIS, NONLINEAR SYSTEMS, ORIENTATION(DIRECTION), PILOTS, PORTABLE EQUIPMENT, RECTIFIERS, RESOLUTION, RISK, SHAPE, SIDES, SPECTRA, TEST AND EVALUATION, TIME, TIME SERIES ANALYSIS, VISION, VISUAL ACUITY, AVIATION MEDICINE.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A5.

DREXEL UNIV PHILADELPHIA PA

(U) A Comprehensive Study on Microstructure Mechanics Relationships of Ceramic Matrix Composites.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-30 Jun 89,

JEC 89 29P

PERSONAL AUTHORS: Wang, A. S.; Barsouni, M. W.

CONTRACT NO. AFOSR-88-0113

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0192

UNCLASSIFIED REPORT

ABSTRACT: (U) The background of this research stems from the need to understand the physical mechanisms of brittle matrix cracks in fiber reinforced ceramic matrix composites. Three major tasks are performed during the research: an in-house fabrication facility is established; a testing technique is developed; and a theory for matrix crack initiation and a numerical simulation method is formulated. A preliminary correlation between theory and experiment is accomplished. This report contains two individual technical papers; one describes the details of the experimental aspects and the other describes the theoretical and the simulative aspects. Ceramic matrix composites, Matrix cracking stress, Specimen fabrication, Testing, Theory, Simulations, Uniaxial fiber, Fracture mechanics, Oxidation, Fiber breaks. (jg)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*COMPOSITE MATERIALS, \*MATRIX MATERIALS, \*MECHANICS, \*MICROSTRUCTURE AXES, CRACKING(FRACTURING), FABRICATION, FACILITIES, FIBERS, FRACTURE(MECHANICS), MATHEMATICAL MODELS, NUMERICAL ANALYSIS, NUMERICAL METHODS AND PROCEDURES, OXIDATION, PHYSICAL PROPERTIES, STRESSES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2302B2.

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STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF APPLIED  
MATHEMATICS AND STATISTI CS

NIELSEN ENGINEERING AND RESEARCH INC MOUNTAIN VIEW CA

(U) The Theory of Structure Functions.

(U) The Effects of Compressibility on a Supersonic Mixing  
Layer.

DESCRIPTIVE NOTE: Final rept. 15 May 88-14 May 88,

DESCRIPTIVE NOTE: Annual rept. 1 Dec 88-30 Nov 89,

MAY 88 34P

DEC 89 23P

PERSONAL AUTHORS: Baxter, Laurence A.

PERSONAL AUTHORS: Nixon, D.; Keefe, L. R.; Kuhn, G. D.

CONTRACT NO. AFOSR-88-0138

CONTRACT NO. F49620-88-C-0003

PROJECT NO. 2304

PROJECT NO. 2308

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR  
TR-90-0197

MONITOR: AFOSR  
TR-90-0191

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the research performed during two years of support by the AFOSR under grant number AFOSR-88-0138. The research falls into four distinct categories: 1) A continuation of the PI's investigation of the theory of structure functions on continua. 2) The construction of a diffusion model for a system subject to continuous wear. 3) The introduction of criteria for reliability growth. 4) An investigation of the stability of stochastic models. Keywords: Theoretical mathematics; Mathematical models; Computerized simulations; Molecular interactions. (KT)

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*MATHEMATICAL MODELS, \*MATHEMATICS, DIFFUSION, FUNCTIONS, GROWTH(GENERAL), MODELS, MOLECULE MOLECULE INTERACTIONS, RELIABILITY, STABILITY, STOCHASTIC PROCESSES, THEORY, WEAR.

ABSTRACT: (U) The objective of the work is to identify the flow mechanism that cause the decrease in spreading rate of supersonic mixing layers as the convective Mach number increases and to suggest means of enhancing the mixing. Two approaches have been taken, one numerical and one analytic. A computer code, TMRC, has been used to simulate both time and space developing mixing layers to get some indication of the flow physics. To complement the numerical study a simple analysis has been developed which explains the variation of mixing rate with convective Mach number. The analysis seems to indicate that little can be done to Mach number. The analysis seems to indicate that little can be done to enhance mixing as such although the real problem of simultaneous mixing and combustion may be more amenable to control. Keywords: Mixing layers; Compressible flow; Fluid dynamics; Airflow. (KT)

DESCRIPTORS: (U) \*AIR FLOW, \*COMPRESSIBLE FLOW, \*BOUNDARY LAYER FLOW, \*SUPERSONIC FLOW, COMBUSTION, COMPUTER PROGRAMS, CONVECTION, FLOW, FLUID DYNAMICS, JET MIXING FLOW, LAYERS, MACH NUMBER, MIXING, NUMERICAL ANALYSIS, PHYSICS, RATES, SYNCHRONISM, VARIATIONS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2308A2.

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MASSACHUSETTS UNIV AMHERST DEPT OF PSYCHOLOGY

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) Adaptively Timed Conditioned Responses and the Cerebellum: A Neural Network Approach,

(U) Theoretical Studies of Silicon Chemistry.

89 13P

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 89,

FEB 90 53P

PERSONAL AUTHORS: Moore, J. W.; Desmond, J. E.; Berthier, N. E.

PERSONAL AUTHORS: Gordon, Mark S.

CONTRACT NO. AFOSR-89-0391

CONTRACT NO. AFOSR-87-0049

PROJECT NO. 2312

PROJECT NO. 2303

TASK NO. A1

TASK NO. B3

MONITOR: AFOSR  
TR-90-0258

MONITOR: AFOSR  
TR-90-0309

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Biological Cybernetics, v62 p17-28 1989.

ABSTRACT: (U) Conditioned responses often reflect knowledge about the timing of a US. This knowledge is manifested in the dependence of response topography on the CS-US interval employed in training. A neural network model and set of learning rules capable of simulating temporally adaptive features of conditioned responses is reviewed, and simulations are presented. In addition, we present a neural network implementation of the model which is designed to reconcile empirical studies of long-term synaptic depression in the cerebellum with neurobiological evidence from studies of the classically conditioned nictitating membrane response of the rabbit. Reprints. (SDW)

DESCRIPTORS: (U) \*CEREBELLUM, \*NEURAL NETS, \*RESPONSE, \*LEARNING, MODELS, NEUROBIOLOGY, RABBITS, REPRINTS, TOPOGRAPHY.

DESCRIPTORS: (U) \*CHEMISTRY, \*SILICON, CHEMICAL REACTIONS, VAPOR DEPOSITION, COATINGS, ELECTRONICS, THEORY, LIGANDS, TABLES(DATA), SILANES, ANIONS, DYNAMICS, DRYING, INTERACTIONS, NUCLEOPHILIC REACTIONS, POLYMERIZATION, SILICIC ACIDS, METHODOLOGY, STATE OF THE ART, SILICON COMPOUNDS, SUBSTITUTES.

IDENTIFIERS: (U) WUAFOSR2303B3, PE61102F.

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AWARE INC CAMBRIDGE MA

AWARE INC CAMBRIDGE MA

(U) The Performance of Wavelets for Data Compression in Selected Military Applications. Volume 2. Supplementary Tables and Graphs.

(U) The Performance of Wavelets for Data Compression in Selected Military Applications.

DESCRIPTIVE NOTE: Final rept.

DESCRIPTIVE NOTE: Final rept. 28 Aug-27 Dec 89.

JAN 90 428P

FEB 90 61P

REPORT NO. AWARE-TR-AD-900223-VOL-2

PERSONAL AUTHORS: Resnikoff, Howard L.

CONTRACT NO. F49620-89-C-0122

REPORT NO. AWARE-TR-AD-900223

MONITOR: AFOSR  
TR-90-0288-VOL-2

CONTRACT NO. F49620-89-C-0122

PROJECT NO. 7145

UNCLASSIFIED REPORT

TASK NO. 00

SUPPLEMENTARY NOTE: See also AD-A219 230. Prepared in cooperation with Atlantic Aerospace Electronics Corp., Greenbelt, MD.

ABSTRACT: (U) Contents: Value of Correlation at Correct Location vs. Compression, Value of Max Laplacian vs. Compression, Value of Max Smoothed Laplacian vs. Compression, Ratio of Peak Correlation to that of Largest and Nearest Side Lobes vs. Compression, Ratio of Peak Laplacian to that of Largest and Nearest Side Lobes vs. Compression, Correlation Side Lobe to Peak Ratio vs. Radial Distance, Laplacian Side Lobe to Peak Ratio vs. Radial Distance, Laplacian vs. Radial Distance, Experimental Data; and Laplacian of correlation of A1 W1 (at various scalings) with A1 (at a given compression) vs. Radial Distance. (sdw)

DESCRIPTORS: (U) \*CORRELATION, \*DATA COMPRESSION, EXPERIMENTAL DATA, GRAPHS, MILITARY APPLICATIONS, PEAK VALUES, RANGE(DISTANCE), RATIOS, SIDELOBES.

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UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-A219 231. Prepared in cooperation with Atlantic Aerospace Electronics Corp., Greenbelt, MD.

ABSTRACT: (U) Wavelets provide a new mathematical and computational approach to representing image data. A wavelet basis is a complete orthonormal system of functions in terms of which image data can be represented. The low computational complexity of the wavelet transform and the bounded support of the wavelet basis functions off high retention of information that typically corresponds to image features, and low workload for computing, compressing, and reconstituting image data. Aware conducted computational experiments to determine the contribution of wavelets to solving two classes of practical problem: 1. Position location by matching observations to a stored image. 2. Identification of objects of specific size or characteristics and sensory clutter. The results suggest that compression using wavelets preserves more than enough information to register position correctly using position reconstituted reference images that have been compressed in excess of 100:1. A variety of analysis made to develop an indication of the relationship between information loss

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and compression are reported. (jhd)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS INC  
PISCATAWAY NJ

DESCRIPTORS: (U) \*DATA COMPRESSION, \*OPTICAL IMAGES,  
CLUTTER, COMPUTATIONS, MATCHING, MATHEMATICS, MILITARY  
APPLICATIONS, POSITION(LOCATION), RETENTION(GENERAL),  
SENSES(PHYSIOLOGY), SIZES(DIMENSIONS), MASS STORAGE,  
WORKLOAD.

(U) International Conference on Free Electron Lasers (11th)  
Conference Digest Held in Naples, Florida on 28 August-  
1 September 1989.

IDENTIFIERS: (U) PE81101E, WUAFOSR714500.

DESCRIPTIVE NOTE: Final rept.

DEC 89 350P

CONTRACT NO. AFOSR-89-0409

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-90-0220

UNCLASSIFIED REPORT

Availability: IEEE, 345 E. 47th St., New York, NY 10017  
PC \$50.00. No copies furnished by DTIC/NTIS.

ABSTRACT: (U) The 11th International Conference on Free  
Electron Lasers was held on 28 Aug to 1 September, 1989.  
(RH)

DESCRIPTORS: (U) \*FREE ELECTRON LASERS, INTERNATIONAL,  
SYMPOSIA.

IDENTIFIERS: (U) PE81102F, WUAFOSR2301A1.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF AERONAUTICS  
AND ASTRONAUTICS

DESCRIPTORS: (U) \*PHYSICS, BIAS, BISTABLE DEVICES.  
DIELECTRICS, ELECTRIC CONDUCTORS, HIGH VOLTAGE, LOW  
VOLTAGE, REPRINTS, SECONDARY, SECONDARY EMISSION, SOLAR  
PANELS, SOLUTIONS(GENERAL), SPACE ENVIRONMENTS, STABILITY,  
SURFACES, VOLTAGE.

(U) The Physics of Positively Biased Conductors Surrounded  
by Dielectrics in Contact with a Plasma.

DESCRIPTIVE NOTE: Rept. for 1 Aug 87-31 Jul 88,

IDENTIFIERS: (U) PE61102F, WUAFQSR2308A1.

MAY 89 11P

PERSONAL AUTHORS: Hastings, Daniel; Chang, Patrick

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-90-0174

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physics Fluids B v1 n5 p1123-  
1132 May 89.

ABSTRACT: (U) The physics of a positively biased conductor surrounded by dielectrics in contact with plasma is investigated. It is shown that because of the presence of secondary emission from the surrounding dielectrics the voltage of the surfaces near the conductor has three solutions. Of the three possible solutions, the high- and low-voltage solutions are stable while the intermediate voltage solution is unstable. For the stable solutions, the low-voltage solution always has very low secondary emission while the high-voltage solution has high secondary emission. The secondary current emitted from the neighboring dielectrics is collected by the conductor. When the voltage on the dielectric undergoes a transition from one bistable solution to another this will be seen as a concomitant increase in the current collected to the conductor. This theory is applied to explain the 'snapover' effect. The snapover effect is observed on high-voltage solar arrays that involve the use of highly biased surfaces in contact with the space environment. It has been observed that when such surfaces are positively biased the current undergoes an anomalous increase at a critical voltage. Reprints. (rnh)

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GENERAL ELECTRIC CORPORATE RESEARCH AND DEVELOPMENT  
SCHENECTADY NY

COMBUSTION, COMPUTATIONS, DIFFUSION, DISSIPATION,  
EQUILIBRIUM(GENERAL), JET FLAMES, LASER APPLICATIONS,  
MATHEMATICAL MODELS, NAVIER STOKES EQUATIONS, PHYSICAL  
PROPERTIES, PROBABILITY, RATES, RECOMBINATION REACTIONS,  
REPRINTS, SCALAR FUNCTIONS, SPECTROSCOPY, TURBULENCE,  
VALUE.

(U) Non-Premixed Turbulent CO/H<sub>2</sub> Flames at Local  
Extinction Conditions,

88 9P

PERSONAL AUTHORS: Correa, S. M.; Gulati, A. IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2.

CONTRACT NO. F49620-85-C-0035

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0185

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Symposium on  
Combustion (22nd) p599-808 1988.

ABSTRACT: (U) The physical phenomena responsible for the local extinction of diffusion flames due to intense turbulence are discussed and a computational model for a jet flame under such conditions is presented. In the model, combustion chemistry is represented by two-body shuffle reactions, taken to be infinitely fast or frozen, and three-body recombination reactions. The scalar dissipation rate field is examined for critical values below which the two-body reactions are assumed to be in partial equilibrium and above which they are assumed to be frozen and the gas therefore unburned. The kinetics of the recombination reactions are activated for the former fraction of the gas. This approach is implemented in a shear-layer finite-volume averaged Navier-Stokes model with k-epsilon/assumed shape pdf sub-models for turbulence. The model is applied to a Re = 15,000 pilot-stabilized 40% Carbon Monoxide/10% Diatomic Hydrogen/50% Diatomic Nitrogen jet flame for which laser-based spectroscopic data on major species and temperature are presented. The fuel is chosen to maximize the probability of local extinction. The model is useful for moderate to high Reynolds number diffusion flames. Reprints. (aw)

DESCRIPTORS: (U) \*EXTINCTION, \*FLAMES, \*FUELS, CHEMISTRY.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

OHIO STATE UNIV COLUMBUS DEPT OF VETERINARY PATHOLOGY

(U) Effect of 1,1-Dimethylhydrazine on Lymphoproliferation  
and Interleukin 2 Immunoregulatory Function,

90 7P

PERSONAL AUTHORS: Bauer, Richard M.; Tarr, Melinda J.;  
Olsen, Richard G.

CONTRACT NO. AFOSR-88-0129

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-90-0257

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Archives of Environmental  
Contamination and Toxicology, v19 p148-153 1990.

ABSTRACT: (U) The studies reported here suggest that the immunomodulatory effects of 1,1-dimethylhydrazine (UDMH) are associated, in part, with interference with interleukin 2 (IL-2) regulatory action. Concanavalin A (Con A)-stimulated (deoxyribonucleic acids) synthesis in murine splenocytes was inhibited from 18.6 to 44.1% at sub-toxic concentrations of UDMH (10 to 50 ug/ml) and IL-2-dependent DNA synthesis in CTLL-20 cells was inhibited from 11.3 to 41.58% at subtoxic concentrations of UDMH (10 to 50 micrograms per milliliter). In addition, UDMH suppressed phorbol myristic acetate (PMA)-stimulated IL-2 production by Con A-stimulated murine splenocytes. In all cases, inhibition was evident at sub-toxic UDMH concentrations and was demonstrated to be independent of inactivation of IL-2 or interference with IL-2 absorption. It is suggested that UDMH has the potential to modify immune function through interference with IL-2 production and especially the lymphoproliferative response to IL-2. Hydrazine, Immunotoxicity, Interleukin 2, Splenocytes, Murine, Reprints, UDMH, Lymphoid tissue. (Jg)

DESCRIPTORS: (U) \*DEOXYRIBONUCLEIC ACIDS, \*HYDRAZINES,  
\*IMMUNITY, FUNCTIONS, INHIBITION, REPRINTS, SYNTHESIS.

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NORTH CAROLINA STATE UNIV AT RALEIGH

TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING(U) A Computational Method for General Higher Index  
Nonlinear Singular Systems of Differential Equations.

89

7P

PERSONAL AUTHORS: Campbell, Stephen L.

89

14P

CONTRACT NO. AFOSR-87-0051

PERSONAL AUTHORS: Walker, Ian D.; Marcus, Steven I.;  
Freeman, Robert A.

PROJECT NO. 2304

CONTRACT NO. AFOSR-86-0029

TASK NO. A1

PROJECT NO. 2304

MONITOR: AFOSR  
TR-90-0310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0312

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Supersedes report dated 6 Aug 88, AD-  
A199 237. Pub. in Numerical and Applied Mathematics, v12  
p555-560 1989.SUPPLEMENTARY NOTE: Pub. in Jnl. of Robotic Systems, v6  
n1 p35-47 1989.ABSTRACT: (U) In the last few years there has been  
substantial progress on the numerical solution of special  
classes of nonlinear singular systems of differential  
equations,  $F(y', y, t) = 0$ . These systems are also called  
differential algebraic equations (DAEs). A general  
numerical procedure for their solution does not currently  
exist. This paper extends a general technique developed  
for the linear time varying singular  $A(t)y'(t) + B(t)y(t)$   
 $= f(t)$  to nonlinear systems. A chemical reactor and  
robotic arm path control problem are worked to illustrate  
the technique. Reprints. (EDC)ABSTRACT: (U) For the situation of multiple cooperating  
manipulators handling a single object, a formulation is  
presented which allows load distribution of the combined  
system to be made while taking manipulator dynamics into  
account. First, object dynamics are used to transform the  
motion task. An integrated procedure for modeling arm  
dynamics is detailed. Then a method is introduced which  
transforms the object load to the joint level. At this  
level, various methods of load distribution that allow  
subtask performance are proposed. These methods allow  
desired object motion while selecting loads desirable to  
alleviate manipulator dynamic loads. Keywords:  
Cooperating robot manipulators; Load distribution;  
Robotics; Reprints. (EDC)DESCRIPTORS: (U) \*DIFFERENTIAL EQUATIONS, ALGEBRA,  
CHEMICAL REACTORS, COMPUTATIONS, CONTROL SYSTEMS,  
NUMERICAL ANALYSIS, NUMERICAL METHODS AND PROCEDURES,  
REPRINTS, ROBOTICS, SOLUTIONS(GENERAL).IDENTIFIERS: (U) Differential algebraic equations,  
PE61102F, WUAFOSR2304A1, Nonlinearity.DESCRIPTORS: (U) DISTRIBUTION, DYNAMIC LOADS, DYNAMICS,  
HANDLING, INTEGRATED SYSTEMS, LOAD DISTRIBUTION,  
MANIPULATORS, MOTION, ROBOTICS, ROBOTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

(U) Analysis of an Identification Algorithm Arising in the  
Adaptive Estimation of Markov Chains,

(U) Comments on the Sensitivity of the Optimal Cost and  
the Optimal Policy for a Discrete Markov Decision  
Process.

90 30P

SEP 89 11P

PERSONAL AUTHORS: Arapostathis, Aristotle; Marcus, Steven  
I.

PERSONAL AUTHORS: Sernik, Enrique L.; Marcus, S. I.

CONTRACT NO. AFOSR-88-0029

CONTRACT NO. AFOSR-86-0029

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR

TR-90-0317

TR-90-0311

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Mathematics of Control,  
Signals, and Systems, v3 p1-29 1990.

SUPPLEMENTARY NOTE: Presented at the Allerton Conference,  
27-29 Sep 89.

ABSTRACT: (U) This reprint investigates an algorithm  
applied to the adaptive estimation of partially observed  
finite-state Markov chains. The algorithm utilizes the  
recursive equation characterizing the conditional  
distribution of the state of the Markov chain, given the  
past observations. It is shown that the process driving  
the algorithm has a unique invariant measure for each  
fixed value of the parameter, and following the ordinary  
differential equation method for stochastic  
approximations, establish almost sure convergence of the  
parameter estimates to the solutions of an associated  
differential equation. The performance of the adaptive  
estimation scheme is analyzed by examining the induced  
controlled Markov process with respect to a long-run  
average cost criterion. (KR)

ABSTRACT: (U) The problem of characterizing the effects  
that uncertainties and/or small changes in the parameters  
of a model can have on optimal policies is considered. It  
is shown that changes in the optimal policy are very  
difficult to detect even for relatively simple models. By  
showing for a machine replacement problem modeled by a  
partially observed, finite state Markov decision process,  
that the infinite horizon, optimal discounted cost  
function is piecewise linear, we find formulas to compute  
the optimal cost and the optimal policy, thus providing a  
means for carrying out sensitivity analyses. Examples are  
presented to show the usefulness of the results. Keywords:  
Algorithms; Stochastic control; Dynamic programming. (KR)

DESCRIPTORS: (U) \*ALGORITHMS, \*MARKOV PROCESSES,  
ADAPTIVE SYSTEMS, APPROXIMATION(MATHEMATICS), CONTROL,  
CONVERGENCE, COSTS, DIFFERENTIAL EQUATIONS, EQUATIONS,  
ESTIMATES, IDENTIFICATION, INVARIANCE, PARAMETERS,  
RECURSIVE FUNCTIONS, REPRINTS.

DESCRIPTORS: (U) \*DECISION MAKING, \*MARKOV PROCESSES,  
\*OPTIMIZATION, ALGORITHMS, COSTS, DYNAMIC PROGRAMMING,  
FUNCTIONS, HORIZON, MODELS, POLICIES, SENSITIVITY,  
STOCHASTIC CONTROL.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1, \*Markov chains.

IDENTIFIERS: (U) \*Discrete Markov decision processes.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

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AD-A219 070 12/7 12/2

CLARKSON UNIV POTSDAM NY DIV OF RESEARCH

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J DEPT OF MATHEMATICS

(U) Collective Properties of Neural Systems and Their Relation to Other Physical Models.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

FEB 90 5P

PERSONAL AUTHORS: Fokas, A. S.

NOV 89 3P

CONTRACT NO. AFOSR-89-0148

PERSONAL AUTHORS: Speer, Eugene R.

PROJECT NO. 2304

CONTRACT NO. AFOSR-89-0214

TASK NO. A4

PROJECT NO. 3842

MONITOR: AFOSR  
TR-90-0304

MONITOR: AFOSR

TR-90-0308

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the tenure of this contract we have been able to characterize solitons in multidimensions. It is well known that there exist several physically important equations in two dimensions (e.g. KdV, NLS) that support certain stable coherent structures called solitons. The solitons in the last 20 years have played an important role in the understanding of many physical and biological phenomena. Although there exist several equations in three dimensions, which share many features with the soliton equations in two dimensions (e.g. KP, DS), these equations could not so far support soliton solutions. We have recently found coherent structures for such equations; these structures have many novel properties not found in the 1+1 solitons and we have called them DROMIONS. The author and V. Zakharov have shown that in addition to Davey-Stewartson equation, many other physical significant nonlinear equations can support Dromions. (kt)

DESCRIPTORS: (U) \*MOLECULE MOLECULE INTERACTIONS, \*ATOMIC STRUCTURE, \*NONLINEAR ALGEBRAIC EQUATIONS, BIOLOGY, COHERENCE, EQUATIONS, MODELS, NERVOUS SYSTEM, PHYSICAL PROPERTIES, STABILITY, STRUCTURES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A4, \*Solitons, \*Dromions.

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ABSTRACT: (U) The Sun 4/60 workstation (SPARCstation) which were purchased according to approved changes in the original proposal have been extensively used by faculty, postdoctoral associates and graduate students. An additional station was acquired to be a file server to the other five. Eduardo Sontag has been using the equipment in his study of first order controllers. Eugen Speer has been investigating interface growth on cellular automaton. Zheming Cheng, a postdoctoral associate has done extensive simulations to understand limiting distributions arising from 'quantum chaos'. The SPARCstation is ideally suited for this significant applications. The equipment will be used for computerized simulations of nonlinear systems. (kt)

DESCRIPTORS: (U) \*COMPUTER APPLICATIONS, \*COMPUTERIZED SIMULATION, \*NONLINEAR SYSTEMS, AUTOMATION, CELLS, CONTROL THEORY, DISTRIBUTION, GROWTH(GENERAL), INTERFACES, LIMITATIONS, PLASMAS(PHYSICS), STUDENTS.

IDENTIFIERS: (U) PE81102F, WUAFOSR3842A5.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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RICE UNIV HOUSTON TEX DEPT OF MATHEMATICAL SCIENCES

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL  
AND COMPUTER ENGINEERING

(U) Linear Programming Tools for Integer Programming.

DESCRIPTIVE NOTE: Final rept. 1 Jul 87-31 Oct 89,  
(U) Advanced Gas Phase Reactor for Growth of Ge sub x Si  
sub 1-x.

OCT 89

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

PERSONAL AUTHORS: Bixby, Robert E.

NOV 89

CONTRACT NO. AFOSR-87-0276

PERSONAL AUTHORS: Greve, David W.; Milnes, A. G.

MONITOR: AFOSR  
TR-90-0313

CONTRACT NO. AFOSR-89-0144

PROJECT NO. 2917

## UNCLASSIFIED REPORT

TASK NO. A3

ABSTRACT: (U) The motivation for this work has been the need for a practical procedure to solve the maximum-weight cut problem (MCP) in undirected graphs. Our primary focus has been on problems arising from considerations in statistical mechanics. These problems are typically posed on grid graphs and some natural variants. There has been significant progress in two areas: solution of the maximum-weight cut problem and development of simplex-based tools for integer programming. Codes developed have been widely used to improve solution time. (edc)

DESCRIPTORS: (U) \*INTEGER PROGRAMMING, \*LINEAR PROGRAMMING, CODING, GRAPHS, GRIDS, PROBLEM SOLVING, SIMPLEX METHOD, SOLUTIONS(GENERAL), STATISTICAL MECHANICS, TIME, VARIATIONS.

IDENTIFIERS: (U) MCP(Maximum Weight Cut Problem),  
PE61102F, WUAFOSR2304B1.

MONITOR: AFOSR  
TR-90-0316

## UNCLASSIFIED REPORT

ABSTRACT: (U) We have designed and constructed a reactor for the growth of Germanium (x) Silicon (1-x) films by the newly developed technique of Ultrahigh voltage/Chemical vapor deposition epitaxy. Films of varying germanium content have been successfully grown and characterized at temperatures as low as 577 C. Work is in progress with respect to optimization of the wafer cleaning procedure and studies of dopant incorporation and device fabrication will be initiated in the near future. Keywords: Gas phase reactors; Crystallography; Crystal growth; Germanium; Silicon; Thermochemistry; Epitaxial growth. (JG)

DESCRIPTORS: (U) \*CRYSTAL GROWTH, \*EPITAXIAL GROWTH, \*GERMANIUM, \*SILICON, CRYSTALLOGRAPHY, OPTIMIZATION, THERMOCHEMISTRY, WAFERS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A3.

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AD-A218 992 7/3 7/6

COLORADO STATE UNIV FORT COLLINS DEPT OF STATISTICS

CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) Multivariate Problems of Statistics &amp; Information Theory.

(U) Silicon-Containing Polymers,

90

DESCRIPTIVE NOTE: Final rept. 15 Apr 83-14 Apr 88,

APR 88

PERSONAL AUTHORS: Mark, James E.

PERSONAL AUTHORS: Srivastava, Jaya

CONTRACT NO. DAAL03-88-K-0032, AFOSR-83-0027

CONTRACT NO. AFOSR-83-0080

MONITOR: ARO, AFOSR  
23255.26-MS, TR-90-0199

PROJECT NO. 2304

UNCLASSIFIED REPORT

TASK NO. A5

MONITOR: AFOSR  
TR-90-0314

## UNCLASSIFIED REPORT

ABSTRACT: (U) Advances in the statistical theory of comparison of lifetime of machines under the generalized Weibull distribution. (with S. Arora) A unique minimal search design of resolution 3.2 for the 24 fractional experiment. Bounds connected with minimal coverings of finite Euclidean spaces. (with R. Hveberg) Sequential probing designs for identifying nonnegligible effects in two m2 factorial experiments,  $m < 4$ . (with S. Arora) An infinite class of resolution 3.2 designs for the 2m factorial experiments. Some basic issues in design theory with special reference to response surfaces. (with S. Arora) On the minimal resolution 3.1 designs for the 24 factorial experiments. Keywords: Military publications; Periodicals. (EG)

DESCRIPTORS: (U) \*MULTIVARIATE ANALYSIS, \*STATISTICS, \*INFORMATION THEORY, MILITARY PUBLICATIONS, RESPONSE, SEARCHING, STATISTICAL DISTRIBUTIONS, SURFACE, THEORY, WEIBULL DENSITY FUNCTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

SUPPLEMENTARY NOTE: Pub. in Advances in Chemistry Series, n224 Silicon-Based Polymer Science: A Comprehensive Resource p47-68 1990.

ABSTRACT: (U) The major categories of homopolymers and copolymers are discussed. These include linear siloxane polymers, (with various alkyl and aryl R and R' side groups); sesquioxane polymers possibly having a ladder structure; siloxane-silarylene polymers, (in which the phenylenes are either meta or para substituted); silalkylene polymers; random and block copolymers and blends of some of polymers 1-4; polysilanes and polysilylenes; and polysilazanes. The structure, flexibility, transition temperatures, permeability, and other physical properties are reviewed. Applications, including uses as high-performance fluids, elastomers, coatings, surface modifiers, separation membranes, photoresists, soft contact lenses, body implants, and controlled-release systems, are discussed. Also of interest are the conversions of silicon-containing materials to novel reinforcing fillers, to ceramics by the sol-gel technique, and to high-performance fibers by controlled thermolyses. Reprints. (kt)

DESCRIPTORS: (U) \*POLYMERS, \*SILICON COMPOUNDS, BLOCK COPOLYMERS, CERAMIC MATERIALS, COATINGS, CONVERSION, COPOLYMERS, ELASTOMERS, FIBERS, FILLERS, FLUIDS, IMPLANTATION, LENSES, LINEAR SYSTEMS, MATERIALS, MEMBRANES, PERFORMANCE(ENGINEERING), PERMEABILITY, PHYSICAL PROPERTIES, POLYSILANES, REINFORCING MATERIALS, REPRINTS, SEPARATION, SIDES, SILOXANES, TRANSITION TEMPERATURE.

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AD-A218 982 CONTINUED

IDENTIFIERS: (U) \*Homopolymers, Sol-Gel Techniques,  
Silakylane polymers.

AD-A218 983 12/6 12/3

GEORGE MASON UNIV FAIRFAX VA

(U) Graphics Equipment for Data Analysis.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

NOV 89

PERSONAL AUTHORS: Wegman, Edward J.

CONTRACT NO. AFOSR-89-0208

PROJECT NO. 3842

TASK NO. A5

MONITOR: AFOSR  
TR-90-0297

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant is a DURIP instrumentation grant. The focus of the grant was to purchase a high-end graphics workstation for statistical data analysis. Our concepts was for the development of a tool that we called data set mapping. This tool will prove beneficial in data sets that are difficult to visualize due to multi-dimensionality. The basic idea is to interface the high and workstation with a high performance minisupercomputer. In our case the Intel iPSC/2 d4/VX, so that processors of the hypercube are tied to graphics windows. The windows are virtual pieces of paper with dynamical graphics in each. This tool is highly interactive. It is assumed that this workstation is on an ethernet with a parallel processor, such that the parallel processor is capable of providing an engine for intense numerical calculations. (KR)

DESCRIPTORS: (U) \*COMPUTER GRAPHICS, \*PARALLEL PROCESSORS, \*STATISTICAL ANALYSIS, COMPUTATIONS, DATA BASES, DATA MANAGEMENT, DATA PROCESSING, DYNAMICS, INTENSITY, MAPPING, NUMERICAL ANALYSIS, STATIONS, STATISTICAL DATA, WINDOWS, WORK.

IDENTIFIERS: (U) PE61104D, WJAFOSR3842A5.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 904 12/1

AD-A218 901 12/4

ARIZONA STATE UNIV TEMPE DEPT OF MATHEMATICS

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

(U) Continuation and Multi-Grid Methods for Bifurcation Problems.

(U) Parameter Estimation in Moving Boundary Problems.

DESCRIPTIVE NOTE: Final rept. 30 Sep 84-30 Nov 89.

MAY 88

JAN 90

PERSONAL AUTHORS: Murphy, K. A.

PERSONAL AUTHORS: Mittelman, Hans D.

CONTRACT NO. AFOSR-86-0256

CONTRACT NO. AFOSR-84-0315

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A3

MONITOR: AFOSR TR-90-0243

MONITOR: AFOSR TR-90-0196

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) In the following we give an overview of the work completed under the grant AFOSR-84-0315 entitled 'Continuation and Multi-grid Methods for Bifurcation Problems' since October 1, 1984. The research under that grant concerns the numerical solution of bifurcation and nonlinear eigenvalue problems for parameter-dependent partial differential equations and systems. The scope of the research is rather wide, stressing the development, study and implementation of computational methods for several classes of difficult nonlinear problems, but, also including the derivation of analytic results in cases where these questions had not been settled before. The work under the grant has resulted in 26 papers in refereed journals or refereed proceedings volumes of major conferences; they are listed at the end of this section. Numerical mathematics; Bifurcation (mathematics); Multi-grid methods; Nonlinear eigenvalues; Partial differential equations. (Jg)

DESCRIPTORS: (U) \*EIGENVALUES, \*NONLINEAR ANALYSIS, \*PARTIAL DIFFERENTIAL EQUATIONS, MATHEMATICS, NONLINEAR SYSTEMS, NUMERICAL ANALYSIS, NUMERICAL METHODS AND PROCEDURES.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2304A3.

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ABSTRACT: (U) We describe an approximation scheme which can be used to estimate unknown parameters in moving boundary problems. The model equations we consider are fairly general nonlinear diffusion/reaction equations of one spatial variable. Here we give conditions on the parameter sets and model equations under which we can prove that the estimates obtained using the approximations will converge to best-fit parameters for the original model equations. We conclude with a numerical example. Keywords: Mathematical models; Reprints. (KT)

DESCRIPTORS: (U) \*BOUNDARY VALUE PROBLEMS, \*MATHEMATICAL MODELS, \*PARAMETERS, EQUATIONS, ESTIMATES, MOTION, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2304A1, \*moving Boundary Problems.

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AD-A218 880 4/1

AD-A218 880 CONTINUED

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Measurement of Momentum Fluxes Near the Summer Mesopause at Poker Flat, Alaska,

AUG 89

PERSONAL AUTHORS: Fritts, David C.; Yuan, Li

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0291

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Atmospheric Sciences, v46 n16 p2569-2579, 15 Aug 89.

ABSTRACT: (U) Observations of the motion field near the summer mesopause using the Poker Flat MST radar in a symmetric six-beam configuration during 8 days of July 1988 were used to examine the mean structure, the wave variances, and the momentum fluxes due to gravity wave and tidal motions. Our results reveal a mean horizontal wind structure generally consistent with previous observations, but with considerable daily variability and large mean shears. Particularly significant is a mean downward (Eulerian) vertical velocity of approx 0.3 m/s, which implies a significant upward flux of wave energy. Horizontal and vertical velocity variances are found to be approx. 1500 and 6 sq m/s sq and to remain nearly constant with height. Momentum flux measurements reveal a largely zonal mean flux of approx. 5 to 15 m sq/s sq that achieves a maximum just below the height of wind reversal. Daily mean values, on the other hand, exhibit large variability, with maxima as large as approx. 30 to 40 m sq/s sq. Hourly momentum flux profiles were found to achieve maximum values of approx. 60 m sq/s sq and to exhibit variations that appear to correlate with the background wave environment. These observations imply significantly stronger forcing of the mean flow in this region than has been inferred at lower latitudes. Gravity waves. Reprints. (EDC)

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DESCRIPTORS: (U) \*GRAVITY WAVES, \*MESOPAUSE, \*MOMENTUM, ALASKA, BACKGROUND, DAILY OCCURRENCE, ENERGY, ENVIRONMENTS, FLOW, FLUX(RATE), HEIGHT, HORIZONTAL ORIENTATION, LATITUDE, MEAN, MEASUREMENT, MOTION, PROFILES, RADAR, REPRINTS, REVERSIBLE, SHEAR PROPERTIES, SUMMER, ATMOSPHERIC TIDES, VARIATIONS, VELOCITY, VERTICAL ORIENTATION, WAVES, WIND.

IDENTIFIERS: (U) Momentum fluxes, PE61102F, WJAFOSR2310A1.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

AD-A218 879

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ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Influence of a Mean Shear on the Dynamical Instability of an Inertio-Gravity Wave,

AUG 89

PERSONAL AUTHORS: Yuan, Li; Fritts, David C.

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0292

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric Science, v46 n16 p2561-2568, 15 Aug 89.

ABSTRACT: (U) Linear theory is used to examine the influence of a mean shear on the dynamical instability of a large-amplitude inertio-gravity wave (IGW). The strength and orientation of the mean shear and the frequency of the IGW are all found to influence the occurrence and characteristics of the dynamical instability. Neutral curves and growth rates of the instability are computed to examine this dependence. The results obtained suggest that an IGW may support dynamical instability over a wider range of frequencies and with larger growth rates in the presence of a mean shear. Reprints.

DESCRIPTORS: (U) \*DYNAMICS, \*LINEARITY, \*SHEAR PROPERTIES, FREQUENCY, GROWTH(GENERAL), MEAN, RATES, REPRINTS, STABILITY, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1.

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ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Stability Analysis of Inertio-Gravity Wave Structure in the Middle Atmosphere,

JUN 89

PERSONAL AUTHORS: Fritts, David C.; Yuan, Li

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0293

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric Science, v46 n12 p1738-1745, 15 Jun 89.

ABSTRACT: (U) We present a stability analysis of the environment due to a large- amplitude inertio-gravity wave. Our purpose is to examine the conditions under which the Kelvin-Helmholtz(KZ) instability may be an effective wave saturation process in the middle atmosphere. The occurrence, range of wavenumber, and growth rate of the KH instability are shown to depend on the IGW frequency and the KH orientation within the wave field because of the influence of wave frequency on the shear and local stratification. Results of the analysis indicate that the KH instability is likely a preferred mode of instability for sufficiently low gravity wave frequencies, but that it cannot occur for high-frequency wave motions in the absence of a mean shear. Inertio-gravity waves are also most unstable to KH instabilities aligned transverse to the direction of large-scale wave propagation. Keywords: Reprints. (KR)

DESCRIPTORS: (U) \*GRAVITY WAVES, \*MESOSPHERE, \*STABILITY, FREQUENCY, GROWTH(GENERAL), HIGH FREQUENCY, LOW FREQUENCY, MEAN MOTION, RATES, REPRINTS, SATURATION, SHEAR PROPERTIES, STRATIFICATION, WAVE PROPAGATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1, \*Inertio gravity waves.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 877 CONTINUED

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Gravity Wave and Turbulence Studies Using a High-Resolution ST Radar.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 87-1 Jan 90.

FEB 90

PERSONAL AUTHORS: Fritts, David C.

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO A1

MONITOR: AFOSR  
TR-90-0290

UNCLASSIFIED REPORT

ABSTRACT: (U) Research under this contract addressed a number of aspects of gravity wave propagation and effects in the lower and middle atmosphere. Observational studies utilized data sets collected at several radar installations and in situ data obtained during two major rocket campaigns. Theoretical studies examined wave instability and ducting, the relationship between neutral and ion density fluctuations in the presence of chemically active species, and the potential for energy exchange due to resonant wave interactions. Our results showed the motion spectrum in the troposphere, stratosphere, and mesosphere to be highly anisotropic, with an upward flux of horizontal momentum largely opposed to the large-scale mean flow. The motion spectrum was found largely to be consistent with gravity wave theory and saturation. These findings have important implications for the forcing of the mean circulation of the lower and middle atmosphere. Theoretical studies revealed low-frequency motions to favor dynamical instabilities and suggested that resonant wave interactions are not likely to be a major factor for energy transfer in the middle atmosphere due to the rapid vertical transport and dissipation of energy. (RRH)

DESCRIPTORS: (U) \*GRAVITY WAVES, ACTIVATION, ATMOSPHERES, CHEMICALS, CIRCULATION, DATA BASES, DENSITY, DISSIPATION,

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EVJ20M

ENERGY, ENERGY TRANSFER, FLOW, FLUX(RATE), HORIZONTAL ORIENTATION, INTERACTIONS, ION DENSITY, LOW ALTITUDE, LOW FREQUENCY, MEAN, MESOSPHERE, MOMENTUM, MOTION, NEUTRAL, RADAR, RADAR STATIONS, RESONANCE, SPECTRA, STABILITY, STRATOSPHERE, THEORY, TRANSPORT, TROPOSPHERE, TURBULENCE, VARIATIONS, VERTICAL ORIENTATION, WAVE PROPAGATION, WAVES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 876

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AD-A218 876 CONTINUED

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

MESOPAUSE, MOTION, PARAMETERS, PRODUCTION, RADAR, REPRINTS, SATURATION, SPECIFICATIONS, SUMMER, WAVES.

(U) Evidence of Gravity Wave Saturation and Local Turbulence Production in the Summer Mesosphere and Lower Thermosphere during the STATE (Structure and Atmospheric Turbulence Environment) Experiment.

IDENTIFIERS: (U) Instability, STATE (Structure and Atmospheric Turbulence Environment), PE61102F, WUAFOSR2310A1.

JUN 88

PERSONAL AUTHORS: Fritts, David C.; Smith, Steven A.; Balsley, Ben B.; Philbrick, C. R.

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0294

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research, v93 n06 p7015-7025, 20 Jun 88.

ABSTRACT: (U) This study used the unique data set obtained during the Structure and Atmospheric Turbulence Environment (STATE) experiment, conducted during June 1983 at Poker Flat, Alaska, to examine the structure and characteristics of the wave field near the summer mesopause. It is shown that the rocket and radar data together permit a much more detailed specification of wave parameters than would be possible using either data set alone. Results of this analysis suggest that the wave field near the summer mesopause is composed, in general, of a superposition of wave motions which act collectively to produce regions in which the wave field is convectively or dynamically unstable. These regions are found to correlate well with zones of enhanced turbulence and small-scale wave activity, suggesting the processes and effects of wave field saturation. Keywords: Gravity waves; Instability; Mesosphere; Thermosphere. Reprints. (EDC)

DESCRIPTORS: (U) \*GRAVITY WAVES, \*MESOSPHERE, \*THERMOSPHERE, \*TURBULENCE, ALASKA, ATMOSPHERIC MOTION, CONVECTION (ATMOSPHERIC), DATA BASES, ENVIRONMENTS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 875 CONTINUED

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Observational Evidence of a Saturated Gravity Wave Spectrum in the Troposphere and Lower Stratosphere.

JUN 88

PERSONAL AUTHORS: Fritts, David C.; Tsuda, Toshitaka; Sato, Toru; Fukao, Shoichiro; Kato, Susumu

CONTRACT NO. F49620-87-C-0024

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-90-0295

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric Science, v45 n12 p1741-1759, 15 Jun 88.

ABSTRACT: (U) Radial velocity and temperature data obtained at the MU Radar Observatory during October and November 1986 are used to examine the character of the motion spectrum in the troposphere and lower stratosphere. It is found that the spectrum is dominated by low-frequency gravity waves with an upward sense of propagation in the lower stratosphere and both upward and downward propagation in the troposphere. Vertical wavenumber spectra of velocity and temperature are used to examine the consistency of the motion spectrum with the saturated spectrum of gravity waves proposed by Smith et al. Results indicate excellent agreement of the observed and predicted velocity and temperature spectra in both amplitude and slope. Vertical wavenumber spectra in area-preserving form reveal a dominant vertical wavelength of approx. 2.5 km, systematic variations in energy density and the dominant vertical scale with time, and consistency between the temporal variations of velocity and temperature variance. Taken together, our results provide strong support both for the view that velocity and temperature fluctuations are due primarily to internal gravity waves and for the saturated spectrum theory and its imposed constraints on wave amplitudes and spectral shape. Reprints. (sdw)

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DESCRIPTORS: (U) \*GRAVITY WAVES, \*SPECTRA, \*STRATOSPHERE, \*TROPOSPHERE, AMPLITUDE, DENSITY, ENERGY, FREQUENCY, INTERNAL WAVES, LOW FREQUENCY, MOTION, OBSERVATORIES, PROPAGATION, RADAR, RADIAL VELOCITY, REPRINTS, SATURATION, SCALE, SHAPE, TEMPERATURE, THEORY, TIME INTERVALS, VARIATIONS, VELOCITY, VERTICAL ORIENTATION, WAVES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 871

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AD-A218 871 CONTINUED

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT  
OF CHEMISTRY

(U) Synthesis and Characterization of Aromatic Polyester  
and Polysiloxane Containing Block Copolymers:  
Multiphase Transparent Atomic Oxygen Resistant Damping  
Materials, Liquid Crystal Films, and Toughening  
Components of Sol/Gel Glasses.

DESCRIPTIVE NOTE: Final rept. 1 May 86-30 Apr 89.

JAN 90

PERSONAL AUTHORS: McGrath, James E.

CONTRACT NO. AFOSR-86-0133

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-90-0285

## UNCLASSIFIED REPORT

ABSTRACT: (U) AFOSR sponsored research on multifunctional polymers which has been conducted in our laboratories over the past three years covers three main areas. Each of the three areas is summarized below and described more completely in some depth in the three sections of this report. The first area includes the synthesis of siloxane modified silicate ceramics produced by sol-gel chemistry followed by ultrastructure processing. Using techniques such as acid free hydrolysis condensation reaction systems, it has been possible to incorporate at least 30% of siloxane oligomers via cohydrolysis of suitably terminated materials in the presence of TMOS. In different but somewhat related work based upon polyimides, extensive studies have been conducted with linear thermoplastic polyimide siloxane copolymers. The polyimide siloxane copolymers prepared to date have been based largely upon aliphatic terminated polydimethyl-siloxanes which have adequate thermal stability for most purposes. The third area of investigation on multifunctional polymers was the synthesis and characterization of isotropic polyarylene sulfone, anisotropic aromatic polyester liquid crystal

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copolymers. We have demonstrated that with as little as 10 or 15 weight % of the liquid crystal segment, organic solvents which would easily dissolve or stress crack the amorphous engineering homopolymers like polysulfones, are no longer able to do so. Multifunctional polymers; Sol-gel; Polysiloxane modified silicates; Polyimide-siloxane copolymers; Isotropic-anisotropic copolymers; Electronic materials; Ceramic materials. (jg)

DESCRIPTORS: (U) \*AROMATIC COMPOUNDS, \*BLOCK COPOLYMERS, \*CERAMIC MATERIALS, \*SILOXANES, AMORPHOUS MATERIALS, ARYL RADICALS, COPOLYMERS, CRACKS, ELECTRONIC EQUIPMENT, ENGINEERING, FILMS, GELS, GLASS, ISOTROPISM, LIQUID CRYSTALS, MATERIALS, OLIGOMERS, ORGANIC SOLVENTS, POLYESTER PLASTICS, POLYIMIDE RESINS, POLYMERS, POLYSULFIDES, POLYSULFONES, SILICATES, STRESSES, SULFONES, SYNTHESIS, THERMAL STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

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AD-A218 811 12/3

TELEOS RESEARCH PALO ALTO CA

PENNSYLVANIA UNIV PHILADELPHIA DEPT OF ELECTRICAL  
ENGINEERING(U) Intelligent Real-Time Problem-Solving: Issues,  
Concepts and Research Methodology.(U) Research on Statistical Techniques for Signal  
Processing.

DESCRIPTIVE NOTE: Final rept. Aug-Nov 89,

DESCRIPTIVE NOTE: Final technical rept. 1 Nov 86-31 Oct  
89,

JAN 90

PERSONAL AUTHORS: Rosenschein, Stanley J.

FEB 90

REPORT NO. TR/90-01

PERSONAL AUTHORS: Kassam, Saleem A.

CONTRACT NO. F49820-89-C-0117

CONTRACT NO. AFOSR-87-0052

PROJECT NO. 5581

PROJECT NO. 2304

TASK NO. A7

TASK NO. A6

MONITOR: AFOSR  
TR-90-0237MONITOR: AFOSR  
TR-90-0264

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Stanford  
Univ., and Oregon State Univ.

ABSTRACT: (U) The Air Force has sponsored a study aimed at laying our research issues in the area of intelligent real-time problem-solving. As part of this study, a team led by Dr. Stanley J. Rosenschein of Teleos Research, has reviewed topics in this area and has participated in a workshop. This report contains a position statement of the Teleos team prepared for that workshop, along with a discussion of the research issues panel held at the workshop itself and of methodologies for evaluating intelligent real-time problem-solving systems. Keywords: Real-time, Problem-solving, Knowledge-based systems, Embedded systems, Intelligent agents, Real-time systems, Computer systems. (JG)

DESCRIPTORS: (U) \*COMPUTERS, \*REAL TIME, \*PROBLEM  
SOLVING, EMBEDDING.

IDENTIFIERS: (U) WUAFOSR5581A7, PE62702F.

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ABSTRACT: (U) The primary accomplishments of this grant were in the areas of: 1) signal detection in non-Gaussian noise, including nonparametric and robust detection; 2) nonlinear edge-preserving filtering of signals in impulsive noise, based on robust estimation procedures; and 3) applications in constant false alarm rate radar detection and image processing. Reference is made to 27 publications. Keywords: Radar signals; Nonlinear filters; Robust estimates; Rank estimates; Nonparametric detection; Non-Gaussian noise; CFAR radar. (edc)

DESCRIPTORS: (U) \*SIGNAL PROCESSING, DETECTION;  
ESTIMATES, FALSE ALARMS, MATHEMATICAL FILTERS, IMAGE  
PROCESSING, IMPULSE NOISE, NOISE, NONLINEAR ANALYSIS,  
RADAR, RADAR SIGNALS, RANK ORDER STATISTICS, RATES,  
SIGNALS, STATISTICAL PROCESSES.

IDENTIFIERS: (U) Robust estimates, CFAR(Constant False  
Alarm Rate), WUAFOSR2304A8, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING  
ITHACA NY

Premixed flames, Turbulent flames. (KR)

(U) The Curvature of Material Surfaces in Isotropic  
Turbulence,

DESCRIPTORS: (U) \*FLAME PROPAGATION, \*SURFACE ANALYSIS,  
\*CURVATURE, \*TURBULENT FLOW, COMBUSTION, FLAMES, FLUIDS,  
HOMOGENEITY, ISOTROPISM, MATERIALS, MIXING, PARTICLES,  
PLANE GEOMETRY, PROPAGATION, REPRINTS, RESPONSE, SHEETS,  
SURFACES, TURBULENCE, VELOCITY.

DEC 89

PERSONAL AUTHORS: Pope, S. B.; Yeung, P. K.; Girmaji, S.  
S.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2.

CONTRACT NO. AFOSR-88-0052

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-80-0178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physics of Fluids A, v1 n12  
p2010-2018 Dec 89.

ABSTRACT: (U) In the study of mixing and reaction in  
turbulent flows, there are several phenomena that can be  
usefully described in terms of surfaces. For example, in  
the flamelet regime of turbulent combustion, reaction is  
confined to the flame sheet- a surface that can be highly  
wrinkled and possibly disconnected. Three types of  
surfaces have been considered. The most basic, and that  
studied here, is the material surface. By definition, a  
material surface moves with the fluid: every point of the  
surface is a fluid particle. For premixed combustion (in  
the flamelet regime) the flame sheet is a propagating  
surface: each point on the surface moves (relative to the  
fluid) at the local flame speed in the direction normal  
to the surface. For nonpremixed reaction, the reaction  
sheet is a constant-property surface: at each point on  
the surface the mixture is stoichiometric. In the  
appropriate limits (vanishing flame speed or diffusivity)  
both propagating surfaces and constant-property surfaces  
become material surfaces. We consider an infinite,  
initially plane material surface in statistically  
stationary, constant-density, homogeneous, isotropic  
turbulence. As time evolves, the turbulence convects,  
stretches, and bends the surface. Keywords: Reprints,

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AD-A218 660 9/3

PURDUE UNIV LAFAYETTE IN

(U) Efficient Frequency Doubling for Synchronously Mode-Locked Dye Lasers.

89

PERSONAL AUTHORS: Fiechtner, G. J.; King, G. B.; Laurendeau, N. M.; Kneisler, R. J.; Lytle, F. E.

CONTRACT NO. AFOSR-84-0323

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0178

UNCLASSIFIED REPORT

ABSTRACT: (U) High power, wavelength-tunable UV picosecond laser pulses can be generated by normal, angle-tuned, extra-cavity frequency doubling. Conversion efficiencies of 1 to 7% can be obtained by careful adjustment of the dye laser cavity length. (rrh)

DESCRIPTORS: (U) \*MODE LOCKED LASERS, CONVERSION, DYE LASERS, EFFICIENCY, FREQUENCY, HIGH POWER, LASER CAVITIES, LENGTH, LIGHT PULSES.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2308A2.

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PURDUE UNIV LAFAYETTE IN DEPT OF CHEMISTRY

(U) Determination of Relative Number Density and Decay Rate for Atomic Sodium in an Atmospheric Premixed Flame by Asynchronous Optical Sampling.

88

PERSONAL AUTHORS: Fiechtner, Gregory J.; Jiang, Yanan; King, Galen B.; Laurendeau, Normand M.; Kneisler, Ronald J.

CONTRACT NO. AFOSR-84-0323

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Symposium on Combustion (22nd), p1915-1921 1988.

ABSTRACT: (U) Asynchronous Optical Sampling (ASOPS) is a pump/probe method that utilizes a dual timebase scheme to determine number densities and decay rates. In this paper we report the first use of ASOPS in a flame environment. The relative number density and decay time of atomic sodium are measured by aspirating a sodium chloride solution into an atmospheric premixed Methane/Oxygen/Nitrogen flame. The pump and probe beams are each tuned to the D2 transition (589.0 nm). Both ASOPS and laser-induced fluorescence are used to determine relative concentrations profiles and saturation curves. Measurements obtained using these techniques are found to be in close agreement, demonstrating the viability of the ASOPS method as a combustion diagnostic and its potential for use in high-pressure turbulent flames. Reprints. (AW)

DESCRIPTORS: (U) \*COMBUSTION, \*DECAY, \*FLAMES, \*SODIUM, ASYNCHRONOUS SYSTEMS, DENSITY, ENVIRONMENTS, HIGH PRESSURE, LASER INDUCED FLUORESCENCE, OPTICAL PROPERTIES, PROBES, PUMPS, RATES, REPRINTS, SAMPLING, SODIUM CHLORIDE, SOLUTIONS(MIXTURES), TIME, TURBULENCE, CONCENTRATION(COMPOSITION), SATURATION.

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JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

IDENTIFIERS: (U) PE61102F, WJAFOSR2308A2, \*Number  
Density, Combustion Diagnostics.

(U) Laser Measurements of State-Resolved Ga and In Atom  
Sticking and Desorption on Metal and Semiconductor  
Surfaces.

DESCRIPTIVE NOTE: Final rept. 1 Dec 86-31 Jan 90,

JAN 90

PERSONAL AUTHORS: Leone, Stephen R.

CONTRACT NO. AFOSR-87-0119

PROJECT NO. 2306

TASK NO. B1

MONITOR: AFOSR  
TR-90-0206

UNCLASSIFIED REPORT

ABSTRACT: (U) Work is carried out on the dynamics of Gallium, Indium, and Arsenic scattering, Sticking, and desorption from silicon single crystals using laser probing of the Ga and In atoms and As dimer gas phase species. Results have been obtained for the binding energies of Ga and In on silicon. Structural patterns of Ga on silicon at various coverages have been determined by LEED studies. Results have been obtained for the binding energies have been determined by LEED studies. Results have been obtained for the desorption of different spin-orbit states and a model developed to explain the observed behavior. Desorption kinetics are also used to probe the Indium Arsenide and Gallium Arsenide heterostructures on silicon and the islanding behavior that occurs for the mixed systems. These results are relevant to the epitaxial growth of GaAs on silicon. (AW)

DESCRIPTORS: (U) \*DESORPTION, \*GALLIUM, \*INDIUM, \*SEMICONDUCTORS, \*SILICON, \*ADHESION, ARSENIC, ARSENIDES, ATOMS, DIMERS, DYNAMICS, EPITAXIAL GROWTH, GALLIUM ARSENIDES, INDIUM COMPOUNDS, KINETICS, LASERS, METALS, MIXING, NUCLEAR BINDING ENERGY, ORBITS, PATTERNS, SCATTERING, SINGLE CRYSTALS, SPIN STATES, CRYSTAL STRUCTURE, SURFACES, VAPOR PHASES, HETEROJUNCTIONS.

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ELECTRON DIFFRACTION.

AD-A218 608 7/4 14/2

CHICAGO UNIV IL JAMES FRANCK INST

(U) Instrumentation for Surface Reaction Dynamics.

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 88-30 Nov 89,

JAN 90

PERSONAL AUTHORS: Sibener, Steven J.

CONTRACT NO. AFOSR-89-0153

PROJECT NO. 3842

TASK NO. A2

MONITOR: AFOSR  
TR-90-0246

UNCLASSIFIED REPORT

ABSTRACT: (U) This instrumentation grant was used to design and fabricate an intense neutral particle beamline for use in gas-surface collision experiments. The three-fold differentially pumped beamline is being used in conjunction with a new inelastic electron-surface scattering spectrometer in order to extend our studies of surface reactivity and gas-surface collision phenomena into many areas. New capabilities include the ability to examine surface reaction kinetics occurring on surfaces (as opposed to monitoring volatile reaction products), encounters between optically excited and translationally selected molecules and surfaces, gaseous condensation, and surface photochemistry. Future surface oxidation studies involving atomic reactants and radicals will also be possible pending construction of appropriate atomic/molecular nozzle beam sources. The instrumentation assembled under the auspices of this grant has directly enhanced research efforts. Keywords: Surface science instrumentation; Molecular beams; Gas-surface interactions; Electron-surface interactions. (AW)

DESCRIPTORS: (U) \*CONDENSATION REACTIONS, \*GAS SURFACE INTERACTIONS, \*MOLECULAR BEAMS, \*PHOTOCHEMICAL REACTIONS, \*REACTION KINETICS, \*LABORATORY EQUIPMENT, COLLISIONS, DYNAMICS, ELECTRONS, GASES, INSTRUMENTATION, INTENSITY, MOLECULES, MONITORING, NEUTRAL, OXIDATION, PARTICLES,

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REACTANTS(CHEMISTRY), REACTIVITIES, SURFACE PROPERTIES,  
SURFACE REACTIONS, SURFACES, VOLATILITY, SPECTROMETRY,  
EXCITATION, SPECTROMETERS.

BRISTOL UNIV (UNITED KINGDOM) DEPT OF INORGANIC  
CHEMISTRY

(U) Chemistry of Polynuclear Metal Complexes with Bridging  
Carbene or Carbyne Ligands. Part 88. (1)  
Carboranetungsteniridium Compounds; Crystal  
Structure of the Complex  $(WIr(mu-CC6H4Me-4)(CO)_2(PEt_3)$   
 $2(Eta(5)-C_2B_9H_9Me_2))$ .

IDENTIFIERS: (U) PE61104D, WUAFOSR3842A2, Molecular Beam  
Sources.

89

PERSONAL AUTHORS: Jeffrey, John C.; Ruiz, Miguel A.;  
Sherwood, Paul; Gordon, F.; Stone, A.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0230

#### UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society,  
Dalton Transactions p1845-1854 1989.

ABSTRACT: (U) The synthesis and properties of several  
tungsten-iridium complexes are reported in which an  
icosahedral  $C_2B_9H_9Me_2$  cage fragment is co-ordinated to  
the tungsten in a pentahapto manner, with the  $C_2B_9$  cage  
also forming bonds to the iridium. Keywords: Carborane,  
Cage compounds, Metal complexes, Reprints. (AW)

DESCRIPTORS: (U) \*IRIDIUM COMPOUNDS, \*LIGANDS, \*METAL  
COMPLEXES, \*TUNGSTEN COMPOUNDS, \*CARBORANES, CHEMICAL  
BONDS, CARBENES, CHEMISTRY, CLATHRATE COMPOUNDS, CRYSTAL  
STRUCTURE, REPRINTS, SYNTHESIS(CHEMISTRY).

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Cage Compounds,  
Carbynes, Carboranes.

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OTIC REPORT BIBLIOGRAPHY

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AD-A218 594

7/6

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

(U) Parameter Estimation in Moving Boundary Problems,

88

PERSONAL AUTHORS: Murphy, K. A.

CONTRACT NO. AFOSR-88-0258

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-90-0242

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the IEEE Conference on Decision and Control (27th), p1656-1661, 7-9 Dec 1988.

ABSTRACT: (U) We present a spline-based approximation method which can be used to estimate unknown variable coefficients, boundary parameters, and initial conditions in certain moving boundary problems of one spatial dimension. We discuss convergence of approximate parameter estimates and the numerical implementation of our method, using as an example a model for the penetration of solvents into polymers. (RRH)

DESCRIPTORS: (U) \*BOUNDARIES, APPROXIMATION(MATHEMATICS), BOUNDARY VALUE PROBLEMS, COEFFICIENTS, ESTIMATES, MOTION, PARAMETERS, PENETRATION, POLYMERS, SOLVENTS, SPATIAL DISTRIBUTION, VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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AD-A218 583

20/6

STATE UNIV OF NEW YORK AT BROOKLYN

(U) Nonlinear Optical Properties of Rigid Rod Polymers and Model Compounds,

89

PERSONAL AUTHORS: Prasad, Paras N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-90-0228

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Materials Research Society Symposia Proceedings, v134 p635-640 1989.

ABSTRACT: (U) Picosecond and femtosecond degenerate four-wave mixing have been used to measure third-order nonlinear optical susceptibility of several rigid-rod polymers and model compounds. A significant X sub (3) with femtosecond response was observed. The effects of processing conditions and structural variations on X sub (3) were studied. Four-wave mixing studies can also be conveniently used to generate ultrasonic phonons of well defined wave length and propagation direction. From this result one can investigate mechanical properties of polymers. Using this technique both the longitudinal and shear components of the elastic moduli for a uniaxially oriented rigid-rod polymer, poly-p-phenylene bis benzoxazole (PBO), were determined. Keywords: Reprints. (kr)

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*POLYMERS, FREQUENCY, MECHANICAL PROPERTIES, MODULUS OF ELASTICITY, NONLINEAR SYSTEMS, PHONONS, PROCESSING, PROPAGATION, REPRINTS, RIGIDITY, RODS, SHEAR PROPERTIES, ULTRASONICS.

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102F.

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

JOHNS HOPKINS UNIV BALTIMORE MD

(U) Indirect Observation of Spin Polarization in Triplet Fluorenylidene at Room Temperature.

89

PERSONAL AUTHORS: Jenks, William S.; Turro, Nicholas J.

PERSONAL AUTHORS: Jiang, H.; Eby, R. K.; Adams, W. W.; Lenhert, Galen

CONTRACT NO. AFOSR-88-0043

CONTRACT NO. AFOSR-87-0320

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. 82

TASK NO. A3

MONITOR: AFOSR  
TR-90-0222

MONITOR: AFOSR  
TR-90-0227

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tetrahedron Letters, v30 n34 p4469-4472 1989.

SUPPLEMENTARY NOTE: Pub. in Materials Research Society Symposia Proceedings, v134 p341-350 1989.

ABSTRACT: (U) The spin polarization of triplet fluorenylidene has been observed at room temperature via CIDEP spectroscopy. The observed absorptive polarization is in agreement with direct observations of the spin polarization of diphenylmethylenes at low temperature. Keywords: Spin polarization; CIDEP spectroscopy; Intersystem crossing; Reprints.

ABSTRACT: (U) We have developed a method which uses laser-generated ultrasound to measure the Young's modulus of fibers as a function of temperature and static tensile stress. For fibers of PBZT, measurements have been made to 580 and 1.7 GPa. The fibers are shown to exhibit nonlinear elasticity which changes systematically with temperature, tensile stress and fiber processing conditions. They exhibit a relaxation associated with a structure change at about 300 - 400 C. We have also used x-ray diffraction to measure both the crystal modulus and aspects of the ultrastructure such as crystal orientation as a function of static tensile stress, crystal size and unit cell. It is shown that improved crystal orientation with increased tensile stress is one of the most important mechanisms of the nonlinear elasticity. The measurements of orientation distribution are combined with other measurements to make calculations of the crystal modulus for the assumptions of uniform stress and uniform strain. These apparent crystal moduli are considerably greater than the measured ultrasonic ones and both are less than the theoretical values. The assumptions of uniform stress and uniform strain have also been used together with the orientation distribution and other parameters to calculate the macroscopic modulus.

DESCRIPTORS: (U) \*POLARIZATION, \*SPIN STATES, ABSORBERS(MATERIALS), LOW TEMPERATURE, OBSERVATION, REPRINTS, ROOM TEMPERATURE, SPECTROSCOPY.

IDENTIFIERS: (U) WJAFOSR2303B2, PE61102F.

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Both results exhibit less nonlinear elasticity than that observed experimentally, indicating that there is another mechanism in addition to the crystal reorientation which contributes to the nonlinear elasticity. Reprints.

DESCRIPTORS: (U) \*ELASTIC PROPERTIES, \*FIBERS, ADDITION, CELLS, CRYSTALS, DISTRIBUTION, LASERS, NONLINEAR SYSTEMS, ORIENTATION(DIRECTION), PROCESSING, REPRINTS, SIZES(DIMENSIONS), STATICS, STRESSES, TENSILE STRESS, ULTRASONICS, VALUE, X RAY DIFFRACTION.

IDENTIFIERS: (U) WUAFOSR2306A3, PE61102F.

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

(U) Time Dependent Approximation Schemes for Some Problems of Parameter Estimation in Distributed Systems.

DEC 87

PERSONAL AUTHORS: Murphy, K. A.

CONTRACT NO. AFOSR-86-0256

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-90-0241

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the Conference on Decision and Control (26th) p165-169 Dec 87.

ABSTRACT: (U) We discuss a parameter estimation method which can be used to estimate functional parameters in delay differential equations and moving boundary problems. In either problem, we approximate the original model equation (which is infinite dimensional) with a system of ordinary differential equations that can be solved numerically in an efficient way. The approximation scheme is based on time-dependent spline elements. For the delay equation with time-varying delay, we present convergence results which indicate that the estimates obtained using the approximating system converge in some sense to a best-fit parameter for the original system. We present numerical test examples in which we estimate time-varying and state-dependent delays, and in which we estimate a time-varying diffusion coefficient in a one phase, one dimensional Stefan problem. Keywords: Reprints. (kr)

DESCRIPTORS: (U) \*ESTIMATES, \*PARAMETRIC ANALYSIS, \*TIME DEPENDENCE, BOUNDARY VALUE PROBLEMS, CONVERGENCE, DELAY, DIFFERENTIAL EQUATIONS, DIFFUSION COEFFICIENT, DISTRIBUTION, EFFICIENCY, EQUATIONS, MATHEMATICAL MODELS, MOTION, NUMERICAL ANALYSIS, PARAMETERS, REPRINTS, SPLINES, TEST AND EVALUATION, TIME, APPROXIMATION(MATHEMATICS), VARIATIONS.

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IDENTIFIERS: (U) WUAFOSR2304A1, PE61102F.

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

(U) Spin-Orbit Effects in the Decomposition Reaction  $\text{N}_3\text{H}(\text{X } 1\text{A}') \rightarrow \text{Yields } \text{N}_2(\text{X } 1 \text{ Sigma}(\text{g})(+)) + \text{NH}(\text{X } 3 \text{ Sigma}(-)), \text{ a } 1 \text{ Delta},$

JAN 90

PERSONAL AUTHORS: Yarkony, David R.

CONTRACT NO. AFOSR-86-0110

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0226

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v92  
n1 p320-323, 1 Jan 90.

ABSTRACT: (U) Using a flexible basis of better than double zeta-polarization quality and configuration interaction (CI) expansions of approximately 200,000 terms the electronic structure aspects of the spin-forbidden decomposition reaction  $\text{N}_3\text{H}(\text{X } 1\text{A}) \rightarrow \text{Yields } \text{NH}(\text{X } 3 \text{ Sigma}(-)) + \text{N}_2(1 \text{ Sigma}(\text{g})(+))$  were studied. The spin-orbit interaction (Hiso) was treated within the Breit-Pauli approximation including both the microscopic spin-orbit and spin-other-orbit contributions. The matrix elements  $h(\text{so})(z), h(\text{so})(y)$  are interpreted in terms of a single configuration model and are compared with analogous quantities in the isolated NH molecule. A qualitative discussion of the decomposition reaction using a Landau-Zener approach is given. Reprints. (sdw)

DESCRIPTORS: (U) \*CONFIGURATIONS, \*ELECTRON TRANSITIONS, \*HELIUM, DECOMPOSITION, INTERACTIONS, MICROSCOPY, MODELS, ORBITS, REPRINTS, RESPONSE, SPINNING(MOTION), MOLECULAR STRUCTURE.

IDENTIFIERS: (U) WUAFOSR2303B3, PE61102F.

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BRISTOL UNIV (UNITED KINGDOM) DEPT OF INORGANIC CHEMISTRY

BRISTOL UNIV (UNITED KINGDOM) DEPT OF INORGANIC CHEMISTRY

(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 89. (1) Tetra- and Penta-nuclear Tungsten-Rhodium Complexes: Crystal Structures of  $(W_3Rh_2(\mu-CO)_2(\mu-CMe)(\mu-C(Me)C(O))(\mu-PPh_2)_2-(\mu_3-CMe)(CO)_2(eta-C_5H_5)_3)$  and  $(W_3Rh_2(\mu-CO)_3(\mu-CMe)(\mu-CMe)PPh_2)(\mu_3-CMe)-(CO)_2(\mu-C_5H_5)_3)$ .

89

PERSONAL AUTHORS: Davies, Simon J.; Stone, F. G.; Howard, Judith A.; Piliotti, Massimino U.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0224

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Dalton Transactions, p1855-1863 1989.

ABSTRACT: (U) Several mixed-metal tungsten-rhodium cluster compounds have been prepared in which the metal-metal bonds are bridged by alkylidyne, ketyl, phosphido, or phosphaaikyne groups. These ligands undergo novel migratory reactions, a feature established by X-ray diffraction studies on selected products. Tungsten, Rhodium, Alkylidyne, Organometallic compounds. Reprints, Nuclear structure, Crystal structure. (jg)

DESCRIPTORS: (U) \*CARBENES, \*LIGANDS, \*METAL COMPLEXES, \*ORGANOMETALLIC COMPOUNDS, \*RHODIUM, \*TUNGSTEN, BRIDGES, CHEMISTRY, CRYSTAL STRUCTURE, DIFFRACTION ANALYSIS, METAL METAL BONDS, NUCLEAR STRUCTURE, REPRINTS, X RAY DIFFRACTION.

IDENTIFIERS: (U) WUAFOSR230382, PE61102F.

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(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 90. (1) Synthesis of the Complexes  $(W_2M_2(\mu-CO)(\mu-CMe)(\mu_3-CMe)-(\mu-C_5H_5)_2)2(CO)_3(eta-C_5H_5)_2$  (M = Rh or Ir) and Related Tetra- and Penta-nuclear Metal Compounds: Interconversion of Ketenyl and Lambda(5) -Phospha-alkyne Ligands Bridging Tungsten-Rhodium Bonds.

89

PERSONAL AUTHORS: Davies, Simon J.; Stone, F. G.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0225

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Dalton Transactions, p1865-1869 1989.

ABSTRACT: (U) The reaction between Iridium 2 ( $\mu$ -Phosphoro-Phenyl 2)(cod)<sub>2</sub> (cod = cyclo-octa-1,5-diene) and (Tungsten(Ketenyl Ligand)(CO)<sub>2</sub>(eta-C<sub>5</sub>H<sub>5</sub>)) in refluxing thf (tetrahydrofuran) affords a tetranuclear mixed-metal compound. The pathway by which this complex is formed has been modelled by a series of reactions involving rhodium-tungsten species. Tungsten, Rhodium, Alkylidyne, Organometallic compounds, Iridium, Carbenes, Carbynes, Ligands, Polynuclear metal complexes, Organic chemistry, Reprints. (jg)

DESCRIPTORS: (U) \*CARBENES, \*FURANS, \*HYDROXYL RADICALS, \*IRIDIUM, \*ORGANOMETALLIC COMPOUNDS, \*RHODIUM, \*TUNGSTEN, BRIDGES, CHEMISTRY, LIGANDS, METAL COMPLEXES, ORGANIC CHEMISTRY, REPRINTS, SYNTHESIS.

IDENTIFIERS: (U) WUAFOSR230382, PE61102F.

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BRISTOL UNIV (UNITED KINGDOM) DEPT OF INORGANIC CHEMISTRY

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Synthesis and Crystal Structure of  $(Mo_2FePt(\mu-\sigma, \sigma, \sigma, \sigma): \eta^5-C_5H_4)_2(CO)_4(HB(pz)_3)_2$  (HB(pz)<sub>3</sub> = Hydrotris(pyrazol-1-yl)borate): A Complex Derived from a 1,1'-Ferrocene Derivative with C (Triple bond)  $Mo(CO)_2(HB(pz)_3)$  Substituents.

89

PERSONAL AUTHORS: Davies, Simon J.; Hill, Anthony F.; Pilotti, Massimino U.; Stone, F. G.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0223

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polyhedron, v8 n18 p2265-2270 1989.

ABSTRACT: (U) The novel tetranuclear metal complex  $(Mo_2FePt \mu-\eta^5-C_5H_4)_2(CO)_4(HB(pz)_3)_2$  (HB(pz)<sub>3</sub> = hydrotris pyrazol-1-yl)borate) has been prepared, and its structure established by X-ray diffraction. The complex is derived from a 1,1'-Ferrocene derivative with C=Mo (CO) 2-(HB(pz)<sub>3</sub>) substituents. Keywords: Molybdenum, Iron, Platinum, Reprints, Crystal structure, Heteronuclear metal-metal bond, Ligands. (JG)

DESCRIPTORS: (U) \*CRYSTAL STRUCTURE, \*IRON, \*LIGANDS, \*MOLYBDENUM, \*PLATINUM, BONDING, METALS, REPRINTS, SYNTHESIS, X RAY DIFFRACTION.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F.

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(U) Ab Initio Studies of Molecular Structures and Energetics. 4. Hexacoordinated NF<sub>6</sub><sup>-</sup> and CF<sub>6</sub>(2<sup>-</sup>) Anions. 90

PERSONAL AUTHORS: Ewig, Carl S.; Var, Wazer, John R.

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-90-0229

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v112 p109-114 1990.

ABSTRACT: (U) Quantum theoretical computations predicted the structural stabilities of two unique hexacoordinated species, NF<sub>6</sub>(<sup>-</sup>) and CF<sub>6</sub>(2<sup>-</sup>). Both were found to be of *O*(h) symmetry with six distinct linkages to the central atom. The energies, equilibrium molecular structures, and vibrational frequencies of both species were computed employing the second-order perturbation approximation (MP2) for the energy. Hypervalent, Anions, Ab Initio, Carbon fluoride anion, Structural stability, Reprints, Electron distribution, Molecular structure, Nitrogen fluoride anion. (tg)

DESCRIPTORS: (U) \*ANIONS, \*CARBON, \*ENERGETIC PROPERTIES, \*FLUORIDES, \*MOLECULAR STRUCTURE, \*NITROGEN COMPOUNDS, ATOMS, COMPUTATIONS, DISTRIBUTION, ELECTRONS, EQUILIBRIUM(GENERAL), FREQUENCY, QUANTUM THEORY, REPRINTS, STABILITY, STRUCTURAL PROPERTIES, VIBRATION.

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102F.

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AD-A218 570 12/6

ARIZONA STATE UNIV TEMPE DEPT OF MECHANICAL AND  
AEROSPACE ENGINEERING

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Multi-Axis, 3-D, Scanning LDA (Laser Doppler  
Anemometer) System for Unsteady Aerodynamics.

(U) Concurrent Computing: Numerical Algorithms and Some  
Applications.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 86-30 Sep  
88,

DESCRIPTIVE NOTE: Final rept. 15 May 82-14 Jan 89,

JAN 90

DEC 89

PERSONAL AUTHORS: Klema, Virginia C.

PERSONAL AUTHORS: Saric, William S.

CONTRACT NO. AFOSR-87-0014

CONTRACT NO. AFOSR-82-0210

PROJECT NO. 2307

PROJECT NO. 2304

TASK NO. A2

TASK NO. A2

MONITOR: AFOSR  
TR-90-0247

MONITOR: AFOSR  
TR-90-0214

UNCLASSIFIED REPORT

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ABSTRACT: (U) This grant developed a low-noise, two-  
velocity-component flow measurement system was developed.  
It consists of a two-color Laser-Doppler anemometer and a  
two-channel hot-wire system. (Jhd)

ABSTRACT: (U) Throughout the period of AFOSR support we  
concentrated on research on hardware design, operating  
system support, mathematical software design, and  
applications programming for concurrent computing systems.  
Multiple Instruction Multiple Data computing systems  
constituted the focus of our attention at the hardware  
and software levels. At every stage we used hardware that  
conformed absolutely to the IEEE Standard for Binary  
Floating Point Arithmetic, P754, IEEE Computer Society.  
(kr)

DESCRIPTORS: (U) \*DOPPLER SYSTEMS, \*LASER ANEMOMETERS,  
AERODYNAMIC CHARACTERISTICS, COLORS, DUAL CHANNEL, HOT  
WIRE ANEMOMETERS, UNSTEADY FLOW, OPTICAL SCANNING, THREE  
DIMENSIONAL.

DESCRIPTORS: (U) \*ALGORITHMS, \*FLOATING POINT OPERATION,  
ARITHMETIC, BINARY ARITHMETIC, COMPUTATIONS, COMPUTER  
PROGRAMMING, COMPUTER PROGRAMS, COMPUTERS, MATHEMATICAL  
PROGRAMMING, SOCIETIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A2.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A2, \*Concurrent  
computing.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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YALE UNIV NEW HAVEN CONN

(D) Nonlinear Spectroscopy of Multicomponent Droplets and Two- and Three-Dimensional Measurements in Flames.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jan-31 Dec 89,

JAN 90

PERSONAL AUTHORS: Chang, Richard K.; Long, Marshall B.

CONTRACT NO. AFOSR-88-0100

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR-90-0282

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A3.

\*SPECTROSCOPY, ABSORPTION, BRILLOUIN ZONES, COMBUSTION, DIAGNOSIS(GENERAL), DROPS, INPUT, INTENSITY, LASER APPLICATIONS, LASER BEAMS, LASERS, LIGHT SCATTERING, LIMITATIONS, LIQUID PHASES, MATCHING, MEASUREMENT, MIXING, MULTIMODE, NONLINEAR SYSTEMS, OPTICAL ANALYSIS, PHASE, PLASMAS(PHYSICS), RADIATION, RAMAN SPECTRA, REQUIREMENTS, STATISTICAL ANALYSIS, STIMULATION(GENERAL), THREE DIMENSIONAL, THREE DIMENSIONAL FLOW, TURBULENCE, VAPOR PHASES, VELOCITY, WAVES.

UNCLASSIFIED REPORT

ABSTRACT: (U) Our progress in the area of nonlinear spectroscopy of droplets includes the following: 1) development of a fluorescent imaging technique which is capable of demarcating the liquid phase of the deformed and ejected droplets from the vapor phase of the ejected material; 2) determination that the absorption of the laser-induced plasma quenches the stimulated Raman process and sets an upper limit on the incident intensity which can be used to generate stimulated Raman scattering (SRS) within droplets; 3) completion of a statistical study of the SRS from single droplets which are irradiated at a fixed input laser intensity (from a single-mode or a multi-mode laser); 4) conclusion that, for single-mode laser excitation, SRS is pumped by the stimulated Brillouin radiation, not directly by the laser radiation; and 5) initiation of studies on the phase-matching requirement for four-wave mixing processes in droplets and on the phase velocity of waves on a morphology-dependent resonance. Keywords: Nonlinear optical diagnostics; Fluorescence imaging; Stimulated Raman scattering; Phase-matching conditions; Phase velocity of modes; Laser diagnostics; Turbulent flames; Premixed flames; Three-dimensional flow measurements; Burning velocity.

DESCRIPTORS: (U) \*FLAMES, \*FLUORESCENCE, \*IMAGES,

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MASSACHUSETTS INST OF TECH CAMBRIDGE

CITY COLL NEW YORK

(U) (DURIN) - Species and Temperature Measurements in Fuel Rich Combustion Regions.

(U) Support for the International Conference on the Physics of Electronic and Atomic Collisions (Sixteenth) Held in New York on 26 Jul - 1 August 1989.

DESCRIPTIVE NOTE: Final rept. 15 May 82-14 Jan 89,

DESCRIPTIVE NOTE: Final rept., 1 Jun-30 Nov 89,

JAN 90

JAN 90

PERSONAL AUTHORS: Klena, Virginia C.

PERSONAL AUTHORS: Lubell, Michael

CONTRACT NO. AFOSR-82-0210

CONTRACT NO. AFOSR-89-0352

PROJECT NO. 2304

PROJECT NO. 2301

TASK NO. A2

TASK NO. A4

MONITOR: AFOSR

TR-90-0214

MONITOR: AFOSR

TR-90-0216

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Throughout the period of AFOSR support we concentrated on research on hardware design, operating system support, mathematical software design, and applications programming for concurrent computing systems. Multiple Instruction Multiple Data computing systems constituted the focus of our attention at the hardware and software levels. At every stage we used hardware that conformed absolutely to the IEEE Standard for Binary Floating Point Arithmetic, P754, IEEE Computer Society. (kr)

DESCRIPTORS: (U) \*MASS SPECTROMETERS, CONTROL SYSTEMS, GAS CHROMATOGRAPHY, METALS, OXIDES, PARTICLES, DIAGNOSTIC EQUIPMENT, ELECTRONIC EQUIPMENT, INSTRUMENTATION, HIGH RATE, SOOT.

ABSTRACT: (U) Topics covered included Photons, Electron-Atom Collisions, Electron-Molecule Collisions, Electron-Ion Collisions, Collisions Involving Exotic Species, Ion-Atom Collisions, Ion-Molecule or Atom-Molecule Collisions, Atom-Atom Collisions, Ion-Ion Collisions, Collisions Involving Rydberg Atoms, Field Assisted Collisions, Collisions Involving Clusters, Collisions Involving Condensed Matter, Experimental Techniques, and Related Topics. Abstracts: Bremsstrahlung of Electrons Scattered by Xenon Atoms; The Cs(p(t)) th2 yields Cs H + H Reactive Collisions: Rotationally Resolved Cross Sections; Experimental and Theoretical Analysis of Collective Effects in Electron Impact Spectra; Resonance in Low Energy Electron. Molecule Collisions; Broadening and Shifts of Calcium Rydberg States. (JHD)

DESCRIPTORS: (U) \*BREMSSTRAHLUNG, \*ELECTRON IMPACT SPECTRA, \*PARTICLE COLLISIONS, ATOMS, CROSS SECTIONS, ELECTRON ENERGY, ELECTRONS, EXPERIMENTAL DESIGN, ION ION INTERACTIONS, IONS, LOW ENERGY, METHODOLOGY, MOLECULES, PHOTONS, SYMPOSIA, THEORY, XENON.

IDENTIFIERS: (U) Rydberg States, PE61102F, WUAFOSR2301A4.

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AD-A218 566

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NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Parameter Estimation in Linear Filtering.

DESCRIPTIVE NOTE: Technical rept.,

OCT 89

PERSONAL AUTHORS: Kallianpur, G.; Selukar, R. S.

REPORT NO. TR-279

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0274

UNCLASSIFIED REPORT

ABSTRACT: (U) Suppose on a probability space  $(\Omega, \mathcal{F}, P)$  a partially observable random process  $(x \text{ sub } 1, y \text{ sub } 1, t > 0; \text{ or } = 0; \text{ is given where only the second component } (y \text{ sub } 1) \text{ is observed. Furthermore assume that } (x \text{ sub } 1, y \text{ sub } 1) \text{ satisfy a certain system of stochastic differential equations driven by independent Wiener processes } (W \text{ sub } 1(t)) \text{ and } (W \text{ sub } 2(t)). \text{ We obtain a large deviation inequality for the maximum likelihood estimator } (m.l.e.) \text{ of the unknown parameter } \theta = (\alpha, \beta). \text{ This inequality enables us to prove the strong consistency, asymptotic normality and convergence of the moments of the m.l.e. The method of proof can be extended to obtain similar results when multi-dimensional instead of one dimensional processes are considered and } \theta \text{ is a k-dimensional vector. (KR)}$

DESCRIPTORS: (U) \*ESTIMATES, \*LINEAR FILTERING, \*PARAMETERS, ASYMPTOTIC NORMALITY, DIFFERENTIAL EQUATIONS, MOMENTS, ONE DIMENSIONAL, STOCHASTIC PROCESSES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

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AD-A218 565

12/3

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Estimation of Hilbert Space Valued Parameters by the Method of Sieves.

DESCRIPTIVE NOTE: Technical rept.,

OCT 89

PERSONAL AUTHORS: Kallianpur, G.; Selukar, R. S.

REPORT NO. TR-278

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0273

UNCLASSIFIED REPORT

ABSTRACT: (U) By extending the ideas of Ibragimov & Hasminski in the finite dimensional parameter estimation a large deviation inequality for a sieve estimator estimating a Hilbert space valued parameter is obtained. This sieve estimator corresponds to a sieve which consists of finite dimensional, compact, convex sets. The inequality suggests a procedure of consistent estimation of Hilbert space valued parameters and naturally provides the convergence rates of the resultant estimators. The usefulness of this approach is demonstrated by applying it to two examples; the first one deals with the estimation of the drift function in a linear stochastic differential equation and the second problem is of the intensity estimation of a nonstationary Poisson process. A detailed discussion of the convergence rates of our estimators and how they compare with the other estimators proposed in the literature is given in both cases. (sdw)

DESCRIPTORS: (U) \*ESTIMATES, \*HILBERT SPACE, CONSISTENCY, CONVERGENCE, DRIFT, FUNCTIONS, INTENSITY, LINEAR DIFFERENTIAL EQUATIONS, PARAMETERS, RATES, SIZES(DIMENSIONS), STOCHASTIC PROCESSES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

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NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

CORNELL UNIV ITHACA NY

(U) Two Barriers Problem for Continuously Differentiable Processes.

(U) Numerical Investigation of Turbulent Flame Sheets.

DESCRIPTIVE NOTE: Technical rept..

DESCRIPTIVE NOTE: Annual technical rept. Dec 88-Dec 89.

OCT 89

JAN 90

PERSONAL AUTHORS: Rychlik, Igor

PERSONAL AUTHORS: Pope, S. B.

CONTRACT NO. TR-277

CONTRACT NO. AFOSR-88-0052

PROJECT NO. 2304

PROJECT NO. 2308

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR TR-90-0272

MONITOR: AFOSR TR-90-0190

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Durbin has presented a compact formula for the first passage density of a Gaussian process, which is locally like Brownian motion, to a smooth barrier. In previous works, we have extended the formula to the case of processes which are smooth functions of a continuously differentiable Gaussian vector process and to more general kinds of first passage time problems, so called marked crossings. In the present paper we obtain similar results for the first passage density in presence of a second absorbing barrier and use it to construct upper and lower bounds for the first passage, rainfall cycle amplitude, zero-crossing wave-length and amplitude densities. Numerical examples illustrate the results. (kr)

DESCRIPTORS: (U) \*BARRIERS, \*PROBLEM SOLVING, \*STATISTICAL PROCESSES, AMPLITUDE, BROWNIAN MOTION, DENSITY, FORMULATIONS, FUNCTIONS, TIME.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

ABSTRACT: (U) Direct numerical simulations of turbulence are being performed to study fundamental processes of turbulent combustion. In the flame-sheet regime of turbulent premixed combustion an important process is the stretching and bending of the surface by the turbulence. These processes have been comprehensively studied for material surfaces, and a similar study for propagating surfaces is nearing completion. A new closure methodology recently proposed by Kraichnan holds much promise for turbulent reacting flows. An analytic solution to the model equations has been obtained; and it is found that the results are in remarkable agreement with those from our earlier direct numerical simulations. Keywords: Turbulent flames, Premixed flames, Turbulence simulations, Surfaces.

DESCRIPTORS: (U) \*FLAMES, \*SHEETS, \*TURBULENCE, CLOSURES, COMBUSTION, EQUATIONS, MATERIALS, MATHEMATICAL ANALYSIS, MATHEMATICAL MODELS, METHODOLOGY, MIXING, NUMERICAL ANALYSIS, PROPAGATION, SIMULATION, SURFACES.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

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AD-A218 551 21/2

MASSACHUSETTS INST OF TECH CAMBRIDGE

PRINCETON UNIV NJ

(U) Reactions of Laser-Generated Free Radicals at Semiconductor Surfaces.

(U) Laminar Flame Speeds of Methane-Air Mixtures under Reduced and Elevated Pressures.

DESCRIPTIVE NOTE: Final rept. 1 Oct 85-31 Dec 89,

DESCRIPTIVE NOTE: Journal paper 1985-1988,

JAN 90

89

PERSONAL AUTHORS: Steinfeld, Jeffrey I.

PERSONAL AUTHORS: Egolfopoulos, F. N.; Cho, P.; Law, C. I

CONTRACT NO. F49620-86-C-0003

CONTRACT NO. AFOSR-89-0293

PROJECT NO. 2303

PROJECT NO. 2308

TASK NO. 81

TASK NO. A2

MONITOR: AFOSR  
TR-90-0189MONITOR: AFOSR  
TR-90-0188

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Reactions of laser-generated free radicals at semiconductor surfaces have been investigated by photoelectron spectroscopy of adsorbed surface layers and by laser-induced fluorescence detection of the gas-phase species. Systems investigated include dissociative chemisorption of XeF<sub>2</sub> and CF<sub>3</sub> on Si (111), IR multiple-photon dissociation of alkylsilanes and characterization of the SiH<sub>2</sub> dissociation product and deposition of metallic films from iron carbonyl. From these experiments, quantitative models have been developed for the reactivity of fluorocarbon radicals at silicon surfaces, intersystem state coupling in excited SiH<sub>2</sub>, and formation of metallic films. Surface chemistry; Laser photochemistry; Fluorocarbon chemistry; Silicon hydrides. (JES)

DESCRIPTORS: (U) \*SEMICONDUCTORS, ADSORPTION, CHEMICAL RADICALS, CHEMISTRY, COUPLING (INTERACTION), DEPOSITION, DETECTION, FLUORINATED HYDROCARBONS, FREE RADICALS, HYDRIDES, IRON, LASER INDUCED FLUORESCENCE, LASERS, LAYERS, METAL FILMS, MODELS, PHOTOCHEMICAL REACTIONS, PHOTOELECTRON SPECTRA, REACTIVITIES, SILICON, SURFACE CHEMISTRY, SURFACES.

IDENTIFIERS: (U) PE81102F, WJAFOSR230381.

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SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v76 p375-391 1989.

ABSTRACT: (U) Using the counter-flow methodology, the laminar flame speeds of methane-air mixtures have been accurately determined over the pressure range of 0.25-3 atm and over extensive lean-to-rich concentration ranges. These flame speeds are then compared with the numerically calculated values obtained by using various published kinetic schemes of either the C<sub>1</sub> mechanism or the full C<sub>2</sub> mechanism. Two such schemes show very close agreement with the experimental data. However, available information cannot further differentiate the relative superiority between them for flame speed calculations, especially the importance of C<sub>2</sub> reactions for moderately rich situations. Two reduced mechanisms are also deduced through sensitivity analysis and are expected to be useful for flame speed calculations and approximate flame structure studies. Keywords: Flames; Flame speeds; Methane air mixtures; Kinetic schemes. Reprints. (JHD)

DESCRIPTORS: (U) \*FLAME PROPAGATION, \*LAMINAR FLOW, \*METHANE, AIR, COMPUTATIONS, EXPERIMENTAL DATA, FLAMES, HIGH PRESSURE, REACTION KINETICS, METHODOLOGY, MIXTURES, REPRINTS, VELOCITY, LOW PRESSURE.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 551 CONTINUED

AD-A218 550 7/3

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Dehydrogenative Polymerization of Silanes to  
Polysilanes by Zirconocene and Hafnocene Catalysts. A  
New Polymerization Mechanism,

89

PERSONAL AUTHORS: Woo, Hee-Gweon; Tilley, T. D.

CONTRACT NO. AFOSR-88-0273

PROJECT NO. 2303

TASK NO. P2

MONITOR: AFOSR  
TR-90-0218

UNCLASSIFIED REPORT

ABSTRACT: (U) A possible mechanism has been identified for the dehydrogenative polymerization of silanes to polysilanes by Zirconium and hafnium catalysts. This mechanism is based on sigma-bond metathesis processes. A new copper siloxide, the first for copper(II), is reported. This compound was designed as a molecular precursor to a copper silicate. Reprints. (JHD)

DESCRIPTORS: (U) \*CATALYSTS, \*POLYMERIZATION,  
\*POLYSILANES, COPPER, HAFNIUM, MOLECULES, PRECURSORS,  
REPRINTS, SILANES, SILICATES, ZIRCONIUM.

IDENTIFIERS: (U) Zirconocene, Hafnocene, Copper Siloxide,  
PE61102F, WUAFOSR2303P2.

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AD-A218 524 21/2

HOUSTON UNIV TX DEPT OF MATHEMATICS

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE  
ENGINEERING

(U) Nonstrictly Hyperbolic Conservation Laws.

DESCRIPTIVE NOTE: Final rept. 15 May 86-14 Nov 89,

NOV 89

88

PERSONAL AUTHORS: Keyfitz, Barbara L.

PERSONAL AUTHORS: Glassman, Irvin

CONTRACT NO. AFOSR-86-0088

CONTRACT NO. AFOSR-89-0034

PROJECT NO. 2304

PROJECT NO. 2308

TASK NO. A9

TASK NO. A2

MONITOR: AFOSR  
TR-90-0233MONITOR: AFOSR  
TR-90-0183

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

**ABSTRACT:** (U) This project has centered on formulating and solving mathematical problems that arise in the study of systems of conservation laws that are not of the classical, strictly hyperbolic type. Potential applications for these results are found in models for three-phases flow in porous media, for compressible two-phase flow, and for flow in elastic and elastoplastic materials (including continuum models for granular flow). Modeling of many different flow processes has led to systems of conservation laws in which the classical assumptions breakdown in a way which leads to distrust of the models. Research in this and allied projects is directed at extending the mathematical theory of conservation laws. The practical goal of this research is to discover which models are well-posed, and, hence, to enable applied scientists to discover which are correct descriptions of various observed instabilities. (JHD)

**DESCRIPTORS:** (U) \*MULTIPHASE FLOW, \*POROUS MATERIALS, COMPRESSIBLE FLOW, CONSERVATION, ELASTIC PROPERTIES, FLOW, HYPERBOLAS, MODELS, PLASTIC PROPERTIES, PROBLEM SOLVING, THEORY, TWO PHASE FLOW.

**IDENTIFIERS:** (U) Conservation Laws, WUAFOSR2304A9, PE61102F.

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IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

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**ABSTRACT:** (U) Sooting tendencies of fuels are analyzed with respect to the type of experimental configuration used -- pre-mixed flames, normal and inverse co-annular, Wolfhard-Parker and counterflowing diffusion flames, or shock tubes. The important effect of temperature in each type of experiment is examined. The relative tendency of various fuels to soot when consumed in pre-mixed and diffusion flames has been determined by the qualitative measurements of critical sooting equivalence ratios and smoke heights at various temperatures and quantitatively confirmed by measurements of chemical species, soot number density and volume fraction. Fuel structure has a significant effect on the sooting tendency of diffusion flames, but little influence in premixed flames. Irrespective of the fuel in diffusion flames soot inception occurs around 1400 K and is dependent somewhat of H atom diffusion. Particle burnout ceases at about 1300 K and is responsible of the smoke height. Keywords: Soot formation; Reprints; Chemical mechanisms of soot; Fuel pyrolysis; Oxygen effect on soot formation. (KT)

**DESCRIPTORS:** (U) \*CHEMICAL REACTIONS, \*COMBUSTION PRODUCTS, \*COMBUSTION DEPOSITS, \*SOOT, BURNOUT, CHEMICALS, COMBUSTION, CONFIGURATIONS, DENSITY, DIFFUSION, FLAMES, FUELS, HEIGHT, MEASUREMENT, MIXING, OXYGEN, PARTICLES, PYROLYSIS, REPRINTS, SHOCK TUBES, SMOKE.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 522 9/3 7/2

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Estimation of Nonlinearities in Parabolic Models for Growth, Predation and Dispersal of Populations.

(U) High Temperature Absorption Coefficients of O<sub>2</sub>, NH<sub>3</sub>, and H<sub>2</sub>O for Broadband Arf Excimer Laser Radiation.

AUG 89

DESCRIPTIVE NOTE: Journal article.

PERSONAL AUTHORS: Banks, H. T.; Murphy, K. A.

89

CONTRACT NO. AFOSR-86-0258

PERSONAL AUTHORS: Davidson, D. F.; Chang, A. Y.; Kohse-Hoinghaus, K.; Hanson, R. K.

PROJECT NO. 2304

CONTRACT NO. AFOSR-89-0067

TASK NO. A1

PROJECT NO. 2308

MONITOR: AFOSR TR-90-0245

TASK NO. A3

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-90-0252

SUPPLEMENTARY NOTE: Pub. in Mathematical Analysis and Applications, v141 n2 p580-602, 1 Aug 89.

UNCLASSIFIED REPORT

ABSTRACT: (U) A convergence theory is given for approximation techniques to treat inverse partial involving systems of nonlinear parabolic problems differential equations. These techniques can be used to estimate density-dependent dispersal coefficients in population models, as well as nonlinear growth and predation terms. Numerical experiences with the resulting algorithms on both conventional (scalar) and vector computers are reported along with an indication of performance of the methods with field data from predator experiments. Keywords: Computerized simulation; Models; Reprints. (KT)

DESCRIPTORS: (U) \*POPULATION(MATHEMATICS). \*MATHEMATICAL MODELS. \*NONLINEAR SYSTEMS. \*NUMERICAL ANALYSIS. ALGORITHMS. COEFFICIENTS. COMPUTERIZED SIMULATION. COMPUTERS. CONVERGENCE. DENSITY. DISPERSING. ESTIMATES. GROWTH(GENERAL). INVERSION. PARABOLAS. POPULATION. REPRINTS. THEORY. VECTOR ANALYSIS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

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EVJ20M

SUPPLEMENTARY NOTE: Pub. in Jnl. of Quantitative Spectroscopy and Radiative Transfer, v42 n4 p267-278 1989.

ABSTRACT: (U) Experimentally-determined absorption coefficients for broadband excimer radiator at 193 millimeter are presented at temperatures up to 3500 Kelvin for Oxygen gas, Ammonia, and Water. These values were determined in high-purity shock tube, either by measuring excimer pulse fractional absorptions or by measuring photolysis-product yields. Correlations between absorption coefficients and vibrational populations of the absorbing species are discussed. Using these absorption coefficients, a prediction can be made of the amount of Oxygen, Amino group, Hydroxyl radical, and H produced in shock-tube excimer-photolysis experiments. This direct production of radicals is attractive for reaction-kinetics studies in high-temperature gases. Keywords: Absorption; High temperature; Excimer laser; Oxygen; Ammonia; Water vapor; Reprints; Inorganic chemistry. (JG)

DESCRIPTORS: (U) \*BROADBAND. \*CHEMICAL RADICALS. \*HIGH TEMPERATURE. \*LASER BEAMS. ABSORPTION. ABSORPTION COEFFICIENTS. AMINES. AMMONIA. EXCIMERS. GASES. HYDROXYL RADICALS. INORGANIC CHEMISTRY. LASERS. OXYGEN. RADIATION.

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REPRINTS, SHOCK TUBES, VIBRATION, WATER, WATER VAPOR.

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

IDENTIFIERS: (U) PE61102F, WJAFOSR2308A3.

(U) An Investigation of the Structure of a Laminar Non-Premixed Flame in an Unsteady Vortical Flow.

DESCRIPTIVE NOTE: Rept. for 1 Sep 84-30 Jun 89,

88

PERSONAL AUTHORS: Lewis, G. S.; Cantwell, B. J.; Vandsburger, U.; Bowman, C. T.

CONTRACT NO. AFOSR-84-0373

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0180

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Symposium (International) on Combustion/The Combustion Institute (22), p5:5-522 1988. Original contains color plates. All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) Although organized vortical motions have been observed in a variety of turbulent flames, there have been only a few experimental studies which have directly examined the structure of a flame imbedded in an unsteady vortical flow. In the present work, this problem is investigated using a laminar co-flowing jet flame in which a periodic vortical motion is induced by acoustic excitation of the fuel stream. A variety of optical planar imaging techniques are employed to define the instantaneous flame structure. Particle tracking is used to obtain the instantaneous two-dimensional velocity field. These measurements are combined to follow the evolution of the flame in the unsteady velocity field over one cycle of the excitation. Keywords: Combustion, Reacting flows, Turbulent mixing, Diagnostics, Particle tracking, Flow topology. (EMK)

DESCRIPTORS: (U) \*COMBUSTION, ACOUSTIC WAVES, CYCLES, EVOLUTION(GENERAL), EXCITATION, EXPERIMENTAL DATA, FLAMES, FLOW, FUELS, IMAGES, METHODOLOGY, MIXING, MOTION, OPTICS, tracking, Flow topology. (EMK)

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PARTICLES, PLANAR STRUCTURES, STREAMS, TOPOLOGY, TRACKING, TURBULENCE, TURBULENT FLOW, TWO DIMENSIONAL, UNSTEADY FLOW, VELOCITY, VORTICES.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Femtosecond Studies of Electron Photodetachment of Simple Ions in Liquid Water: Solvation and Geminate Recombination Dynamics,

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

OCT 89

PERSONAL AUTHORS: Long, Frederick H.; Lu, Hong; Eisenthal Kenneth B.

CONTRACT NO. AFOSR-88-0014

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0238

UNCLASSIFIED REPORT

ABSTRACT: (U) Aqueous solutions of simple ions such as OH(-) and Cl(-) have fascinated many scientists. In this communication we present the first femtosecond time-resolve studies of electron photodetachment in aqueous solution. The solvation of the ejected electron in the aqueous media and the subsequent recombination dynamics of the neutral atom with the electron have been measured. Relevant to this are several recent experimental studies of electrons in neat liquids using femtosecond lasers. Keywords: Photoionization; Recombination reactions; Reprints.

DESCRIPTORS: (U) \*CHEMICAL DISSOCIATION, \*ELECTRONS, \*PHOTOCHEMICAL REACTIONS, ATOMS, DYNAMICS, EXPERIMENTAL DATA, IONS, LASERS, LIQUIDS, MEDIA, NEUTRAL, PHOTOIONIZATION, RECOMBINATION REACTIONS, REPRINTS, SOLUTIONS(MIXTURES), SOLVATION, WATER.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Aqueous solutions.

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ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

Texture gradients; Reprints. (JHD)

(U) Shape from Texture: Integrating Texture-Element  
Extraction and Surface Estimation.

DESCRIPTORS: (U) \*RECOGNITION, \*IMAGE PROCESSING,  
\*TEXTURE, ASPECT RATIO, CLOUDS, DETECTION, ESTIMATES,  
EXTRACTION, GRADIENTS, MEASUREMENT, ORIENTATION(DIRECTION)  
PLANAR STRUCTURES, REGIONS, REPRINTS.

DEC 89

PERSONAL AUTHORS: Blostein, Dorothea; Ahuja, Narendra

IDENTIFIERS: (U) Scene Analysis.

CONTRACT NO. AFOSR-86-0009

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-90-0255

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on Pattern  
Analysis and Machine Intelligence, v11 n12 p1233-1251 Dec  
89.

ABSTRACT: (U) A perspective view of a slanted textured  
surface shows systematic changes in the density, area,  
and aspect-ratio of texture elements. These apparent  
changes in texture element properties can be analyzed to  
recover information about the physical layout of the  
scene. However, in practice it is difficult to identify  
texture elements, especially in images where the texture  
elements are partially occluded or are themselves  
textured at a finer scale. To solve this problem, it is  
necessary to integrate the extraction of texture elements  
with the recognition of scene layout. We present a method  
for identifying texture elements while simultaneously  
recovering the orientation of textured surfaces. A  
multiscale region detector, based on measurements in a  
Delta 2 G (Laplacian-of-Gaussian) scale-space, is used to  
construct a set of candidate texture elements. True  
texture elements are selected from the set of candidate  
texture elements by finding the planar surface that best  
predicts the observed areas of the candidate texture  
elements. Results are shown for a variety of natural  
textures, including waves, flowers, rocks, clouds, and  
dirt clods. Keywords: Integration; Multiscale structure;  
Natural textures; Perspective view; Region detection;  
Shape from texture; Surface orientation; Texture elements;

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STATE UNIV OF NEW YORK AT BUFFALO AMHERST

-(U) Direct Numerical Simulations of a Two-Dimensional  
Reacting, Spatially Developing Mixing Layer by a  
Spectral-Element Method,

IDENTIFIERS: (U) PE61102F, WUAF05R2308A2, Spectral  
Element Method, Damkohler Number.

88

PERSONAL AUTHORS: GIVI, P.; JOU, W.-H.

CONTRACT NO. F49620-85-C-0067

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0271

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Symposium (International) on  
Combustion/The Combustion Institute (22), p635-643 1988.

ABSTRACT: (U) The spectral-element method, a numerical  
scheme that combines the accuracy of spectral methods  
with the versatility of finite element techniques, has  
been employed to study the mechanisms of mixing and  
chemical reactions in a diffusion flame stabilized on a  
two-dimensional planar mixing layer. The results of  
simulations of the harmonically forced, spatially  
developing flow are statistically analyzed to examine the  
compositional structure of the flame near quenching. The  
results indicate that as the flame approaches extinction,  
the mean and the rms values of the reactant  
concentrations decrease while those of the product  
concentration and temperature increase. This behavior is  
enhanced by increasing the hydrodynamic characteristic  
time (reducing the local Damkohler number) and is  
consistent with that observed experimentally. Keywords:  
Direct numerical simulations; Spectral element method;  
Turbulent reacting mixing layer; Reprint. (JHD)

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*TURBULENT  
DIFFUSION, \*FLAMES, ACCURACY, EXTINCTION, FINITE ELEMENT  
ANALYSIS, FLOW, LAYERS, MIXING, PLANAR STRUCTURES,  
REPRINTS, DIGITAL SIMULATION, SPECTRUM ANALYSIS,  
STABILIZATION.

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SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING  
ITHACA NY

HIGH RESOLUTION, ISOTROPISM, DIGITAL SIMULATION, MOMENTS,  
TIME SERIES ANALYSIS.

(U) Lagrangian Statistics from Direct Numerical  
Simulations of Isotropic Turbulence.

IDENTIFIERS: (U) Kolmogorov Functions, PE61102F,  
WUAFOSR2308A2.

89

PERSONAL AUTHORS: Yeung, P. K.; Pope, S. B.

CONTRACT NO. AFOSR-85-0083

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0187

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Fluid Mechanics, v207  
p531-586 1989.

ABSTRACT: (U) A comprehensive study is reported of the  
Lagrangian statistics of velocity, acceleration,  
dissipation and related quantities in isotropic  
turbulence. High-resolution direct numerical simulations  
are performed on 64-cubed and 128-cubed grids, resulting  
in Taylor-scale Reynolds numbers  $Re_\lambda$  in the  
range 38-93. The low-wavenumber modes of the velocity  
field are forced so that the turbulence is statistically  
stationary. Using an accurate numerical scheme, of order  
4000 fluid particles are tracked through the computed  
flow field, and hence time series of Lagrangian velocity  
and velocity gradients are obtained. The results reported  
include: velocity and acceleration autocorrelations and  
spectra; probability density functions (p.d.f.'s) and  
moments of Lagrangian velocity increments; and p.d.f.'s,  
correlation functions and spectra of dissipation and  
other velocity-gradient invariants. Keywords: Direct  
numerical simulation; Fluid mechanics; Turbulence;  
Lagrangian; Probability density functions; Kolmogorov.  
(JHD)

DESCRIPTORS: (U) \*FLUID MECHANICS, \*LAGRANGIAN FUNCTIONS,  
\*PROBABILITY DENSITY FUNCTIONS, \*TURBULENCE, ACCURACY,  
AUTOCORRELATION, CORRELATION, FLOW FIELDS, GRADIENTS,

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CITY COLL NEW YORK DEPT OF MECHANICAL ENGINEERING

(U) Microcracking and Toughness of Ceramic-Fiber/Ceramic-Matrix Composites under High Temperature.

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-30 Sep 89,

DEC 89

PERSONAL AUTHORS: Delale, F.; Liaw, B. M.

REPORT NO. CUNY-RF-447239

CONTRACT NO. AFOSR-87-0288

PROJECT NO. 2302

TASK NO. B2

MONITOR: AFOSR  
Tr-80-0203

UNCLASSIFIED REPORT

ABSTRACT: (U) This report contains the results of the research project entitled: 'Microcracking and Toughness of Ceramic-Fiber/Ceramic-Matrix Composites Under High Temperature.' Microcracking mechanisms and toughness of Nicalon (Silicon carbide)/Silicon carbide composite at elevated temperature are studied analytically and experimentally. First the fiber distribution patterns in the ceramic composite are determined by observing the specimens under optical and scanning electron microscopes. Thus the effect of fibers and fiber interactions on the microcrack propagation are investigated analytically through the single-fiber, the two-fiber, and the ring models. Monolithic SiC specimens are tested under varying temperature to determine the effect of temperature on the toughness of the matrix material. The Nicalon/SiC composite specimens are then tested at various temperatures. The combined effect of temperature and fibers on the toughness of the matrix is expressed by introducing the concept of 'apparent fracture toughness.' The experimental results indicate that for the Nicalon/SiC composite the 'apparent fracture toughness' decreases with local volume fraction of fibers. Volume fraction and temperature. Keywords: Composites; Ceramic; Fracture; High temperature; Microcracking; Materials; Fibers. (U)

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DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*FIBERS, \*MICROCRACKING, ELECTRON MICROSCOPES, FRACTURE (MECHANICS), HIGH TEMPERATURE, INTERACTIONS, MATRIX MATERIALS, MODELS, OPTICAL PROPERTIES, RINGS, SCANNING ELECTRON MICROSCOPES, SILICON CARBIDES, TOUGHNESS.

IDENTIFIERS: (U) WUAFOSR2302B2, PE61102F.

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STATE UNIV OF NEW YORK AT BUFFALO AMHERST

NUMERICAL ANALYSIS, PROBABILITY DENSITY FUNCTIONS,  
TURBULENCE, VALIDATION.

(U) Direct Numerical Simulations of Mixing and Reaction in  
a Nonpremixed Homogeneous Turbulent Flow,

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

89

PERSONAL AUTHORS: McMurtry, Patrick A.; Givi, Peyman

CONTRACT NO. F49620-85-C-0067

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0270

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v77  
p171-185 1989.

ABSTRACT: (U) Direct numerical simulations have been performed to study the mechanisms of mixing and chemical reaction in a three dimensional, homogeneous turbulent flow under the influence of the reaction of the type A + B products. The results are used to examine the applicability of Toor's hypothesis and also to determine the range of validity of various coalescence-dispersion (C/D) turbulence models that have been used previously to model the effects of turbulent mixing in such flows. The results of numerical simulations indicate that the probability density function (PDF) of a conserved Shvab-Zeldovich scalar quantity, characterizing the mixing process, evolves from an initial double-delta distribution to an asymptotic shape that can be approximated by Gaussian distribution. During this evolution, the PDF cannot be characterized by its first two moments; therefore, the application of Toor's hypothesis is not appropriate for the predictions of such flows. Molecular mixing; Coalescence-dispersion (C/D) models; Homogeneous turbulence; Direct numerical simulation. (jes)

DESCRIPTORS: (U) \*TURBULENT FLOW, CHEMICAL REACTIONS, HOMOGENEITY, HYPOTHESES, MATHEMATICAL MODELS, MIXING, MODELS, MOLECULES, MOMENTS, NORMAL DISTRIBUTION,

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TECHNO-SCIENCES INC GREENBELT MD

\*(U) Nonlinear Dynamics and Control of Flexible Structures.

DESCRIPTIVE NOTE: Annual rept. Sep 88-Aug 89,

DEC 89

PERSONAL AUTHORS: Bennett, W. H.; Kwatny, H. G.;  
Blakenship, G. L.; Akhrif, O.

REPORT NO. TSI-89-1212-WB

CONTRACT NO. F49620-87-C-0103

PROJECT NO. D812

TASK NO. K1

MONITOR: AFOSR  
TR-90-0200

UNCLASSIFIED REPORT

ABSTRACT: (U) Basic performance requirements for space-based directed energy weapons involve unprecedented requirements for integrated control of rapid retargeting and precision pointing of space structures. Multibody interactions excite nonlinear couplings which complicate the dynamic response. Attempts to reduce flexure response for such weapon platforms by passive techniques alone may be inadequate due to stringent pointing requirements. The principal objective of the research program is the validation and testing of high precision, nonlinear control of multibody systems with significant structural flexure where interactions arise due to rapid slewing. Dominant nonlinear couplings affecting LOS response have been identified based on a comprehensive model of the nonlinear multibody dynamics of a generic space weapon. The innovative approach to LOS slewing/pointing developed in this study is based on implementation of decoupling (by feedback control) of the principal nonlinear dynamics and structural flexure response. In this study we have focused on the implementation of partial feedback linearization and decoupling and have identified practical conditions for its implementation. A principal contribution of the study is the reconciliation of design of discontinuous control via sliding mode control with

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partial feedback linearization for rapid slewing of system effective LOS. The report includes extensive simulation and tradeoff studies of nonlinear control implementation of rapid slewing and precision pointing of a generic model of a space-based laser beam expander. (kt)

DESCRIPTORS: (U) \*AIMING, \*DIRECTED ENERGY WEAPONS, \*DYNAMIC RESPONSE, \*SPACE WEAPONS, \*TARGETING, BODIES, CONTROL, COUPLINGS, DYNAMICS, FEEDBACK, FLEXIBLE STRUCTURES, FLEXURAL PROPERTIES, INTEGRATED SYSTEMS, INTERACTIONS, LINE OF SIGHT, LINEARITY, MODELS, NONLINEAR SYSTEMS, PASSIVE SYSTEMS, PERFORMANCE(ENGINEERING), PRECISION, REQUIREMENTS, RESPONSE, SIMULATION, SLEWING, SLIDING, SPACE BASED, STRUCTURAL PROPERTIES, STRUCTURAL RESPONSE, TRADE OFF ANALYSIS, VALIDATION, WEAPONS.

IDENTIFIERS: (U) WUAFOSRD812K1, PE61102F, \*Flexible Structures.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB

(U) Evaluation Methodology for Software Engineering.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 89,

DEC 89

PERSONAL AUTHORS: Blum, Bruce I.

CONTRACT NO. AFOSR-89-0080

PROJECT NO. 2304

TASK NO. A2

MONITOR: AFOSR  
TR-90-0215

IDENTIFIERS: (U) WUAFOSR2304A2, PE61102F, \*Software  
Design Analysis, Software Development, Computer Program  
Development, Computer Program Design.

UNCLASSIFIED REPORT

ABSTRACT: (U) This is the final report on research intended to investigate the most effective methods for software engineering evaluation. The objective of this work is to identify and evaluate the methods used to measure the impact of changes to the software process. In particular, there is a special interest in the evaluation of benefit improvements when different process models are used. The research has pursued two types of activity. First, evaluation methods used in other disciplines have been reviewed for their utility in software engineering. The long-term goal is to produce a taxonomy of methods with a suggested range of strengths for software engineers. The availability of this unified view would help analysts select the most appropriate evaluation techniques for a given class of task. The second class of activity employed small studies in which evaluation methods could be tested and/or quantifiable concepts could be modeled. Because the research goal is to provide a means to appraise alternative development paradigms, most of the effort was spent on the study of an essential software process model (i.e., a meta-process model) and the evaluation of paradigms that alter the process within the model.

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, \*COMPUTER PROGRAMS, \*COMPUTER AIDED DESIGN, ENGINEERS, MODELS, STRENGTH(GENERAL), TAXONOMY, TEST AND EVALUATION.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 473 12/3

AD-A218 469 21/1 21/2

MICHIGAN UNIV ANN ARBOR DEPT OF STATISTICS

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Bayesian Nonparametric Prediction and Statistical Inference.

(U) Topology of Three-Dimensional, Variable Density Flows,

DESCRIPTIVE NOTE: Final rept. 1 Apr 87-31 Mar 89,

DEC 89

SEP 89

PERSONAL AUTHORS: Cantwel, Brian; Lewis, Gregory; Chen, Jacqueline

PERSONAL AUTHORS: Hill, Bruce M.

CONTRACT NO. AFOSR-84-0373

CONTRACT NO. AFOSR-87-0192

PROJECT NO. 2308

PROJECT NO. 2304

TASK NO. A2

TASK NO. A5

MONITOR: AFOSR

TR-90-0181

TR-90-0211

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The problem of Bayesian nonparametric prediction and statistical inference is formulated and discussed. A solution is proposed based upon A sub n and H sub n as in Hill (1988). The meaning of parameters in the subjective Bayesian theory of Bruno de Finetti is discussed in connection both with A sub n and with conventional parametric models. It is argued that the usual sharp distinction between prediction and parametric inference is largely illusory. The finite version of de Finetti's theorem is emphasized for the practice of statistics, with the infinite case used only to obtain approximations and insight. (kr)

DESCRIPTORS: (U) \*NONPARAMETRIC STATISTICS, \*STATISTICAL INFERENCE, BAYES THEOREM, MATHEMATICAL MODELS, PARAMETRIC ANALYSIS, MATHEMATICAL PREDICTION, STATISTICS, THEORY.

IDENTIFIERS: (U) WUAFO5R2304A5, PE81102F.

ABSTRACT: (U) This paper is concerned with the interpretation of unsteady, variable - density flow fields. The topology of the flow is determined by finding critical points and identifying the character of local solution trajectories. The time evolution of the flow is studied by following the paths of the critical points in the three-dimensional space of invariants of the local deformations tensor. The methodology can be applied to any smooth vector field and its associated gradient tensor including the vorticity and pressure gradient fields. This approach provides a framework for describing the geometry of complex flow patterns. Concisely summarizing that geometry in the space of invariants of the local gradient tensor may be a useful way of gaining insight into time - dependent processes described by large computational data bases. Applications to the descriptions of a flickering diffusion flame and a compressible wake are discussed. Keywords: Combustion, Reacting flows, Turbulent mixing, Diagnostics, Particle tracking, Flow topology. (KR)

DESCRIPTORS: (U) \*FLOW FIELDS, \*UNSTEADY FLOW, \*THREE DIMENSIONAL FLOW, \*TOPOLOGY, COMBUSTION, COMPRESSIBLE FLOW, COMPUTATIONS, DATA BASES, DEFORMATION, DENSITY, DIFFUSION, EVOLUTION(GENERAL), FLAMES, FLOW, GRADIENTS, MIXING, PARTICLES, PATTERNS, PRESSURE GRADIENTS, SOLUTIONS(GENERAL), TENSORS, THREE DIMENSIONAL, TIME, TRACKING, TRAJECTORIES, TURBULENT FLOW, VARIABLES, VECTOR

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ANALYSIS, VORTICES, WAKE.

BAYLOR COLL OF MEDICINE HOUSTON TX

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

(U) Long-Term Potentiation of Hippocampal Mossy Fiber Synapses is Blocked by Postsynaptic Injection of Calcium Chelators.

89

PERSONAL AUTHORS: Williams, Stephen; Johnston, Daniel

CONTRACT NO. AFOSR-88-0142

MONITOR: AFOSR  
TR-90-0057

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Neuron, v3 p583-588 Nov 89.

ABSTRACT: (U) The role of intracellular calcium in an amino-phosphonovalerate-insensitive form of long-term potentiation (LTP) has been studied at the hippocampal mossy fiber synapse. Intracellular calcium was buffered by iontophoretic injection of either BAPTA or QUIN-2 into CA3 pyramidal neurons. The slow calcium-dependent after hyperpolarization was used as an indicator of buffering. Long-term potentiation was elicited in control and in amino-phosphonovalerate-treated cells (6/6 and 4/5 cell, respectively). In contrast, long-term potentiation was observed in only 2/9 BAPTA-loaded cells and in 1/4 QUIN-2 loaded cells. The magnitude of LTP for control and APV-treated cells was not significantly different, but both groups showed significantly greater long-term potentiation than BAPTA-loaded cells. These results suggest that an increase in postsynaptic calcium is required for the induction of mossy fiber long-term potentiation. Hippocampus, LTP, Mossy fiber synapses, Calcium, CA3, Reprints, Neurochemistry, Chelate compounds. (jg)

DESCRIPTORS: (U) \*CALCIUM, \*CHELATE COMPOUNDS, \*HIPPOCAMPUS, \*NEUROCHEMISTRY, CELLS(BIOLOGY), REPRINTS.

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AD-A218 454 CONTINUED

RICE UNIV HOUSTON TEX DEPT OF MATHEMATICAL SCIENCES

(U) The Effects of Caustics in Acoustic Inverse Scattering Experiments.

DESCRIPTORS: (U) \*ACOUSTIC SCATTERING, \*CAUSTICS, \*INVERSE SCATTERING, ACOUSTIC VELOCITY, ACOUSTICS, HETEROGENEITY, INTEGRALS, INVERSION, LINEARITY, OPERATORS(PERSONNEL), OSCILLATION, PERTURBATIONS, RAY TRACING, SIGNALS, VALIDATION, VELOCITY, WAVEFRONTS.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 89.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4.

FEB 90

PERSONAL AUTHORS: Symes, W. W.; Percell, Cheryl B.

REPORT NO. TR89-3

CONTRACT NO. AFOSR-89-0056

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-90-0263

UNCLASSIFIED REPORT

ABSTRACT: (U) Most inversion techniques described in the literature rely on the validity of ray tracing, which breaks down in the presence of caustics. The linearized acoustic inverse problem with constant reference velocity is analyzed in order to quantify the effects of a caustic in a probing wavefront on the scattered signal. When the sound velocity is perturbed by a localized unidirectional, high frequency inhomogeneity, the surprising result obtained is that the energy in the scattered field is spread out if the perturbation is located on the caustic. This spreading of energy allows the construction of an oscillatory integral representation of the scattered field, which has the same form, whether or not an incident caustic is present. On the other hand, a sequence of localized high frequency sound velocity perturbations is constructed such that the size of the scattered signal relative to the size of the inhomogeneity becomes arbitrarily large as the support of the perturbation approaches the caustic. In regions where there are no caustics, a general inverse operator is found for smoothly varying reference velocities. This operator is shown to be equivalent to an inverse operator constructed by Beylkin. (kr)

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RICE UNIV HOUSTON TEX DEPT OF MATHEMATICAL SCIENCES

NORTHWESTERN UNIV EVANSTON IL DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

(U) Research in Constrained Optimization.

(U) Center for Surface Radiation Damage Studies.

DESCRIPTIVE NOTE: Final technical rept. 15 May 88-14 May  
89,

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 89,

MAY 89

OCT 89

PERSONAL AUTHORS: Dennis, John E., Jr.; Tapia, R. A.

PERSONAL AUTHORS: Marks, Laurence D.

CONTRACT NO. AFOSR-85-0243

CONTRACT NO. AFOSR-86-0344

PROJECT NO. 2304

PROJECT NO. 3484

TASK NO. A8

TASK NO. A2

MONITOR: AFOSR  
TR-90-0261

MONITOR: AFOSR  
TR-90-0221

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The research in constrained optimization supported at Rice by this grant has been significant and extensive. This work involves the development and analysis of novel practical approaches to the classical problem of minimizing a real-valued nonlinear function of several, perhaps many, real variables subject to nonlinear equality constraints on the variables and the problem of finding a zero of a system of nonlinear equations. Included in this research is the continued development of the successful Cella-Dennis-Tapia trust-region approach to equality constrained optimization. (eg)

DESCRIPTORS: (U) \*OPTIMIZATION, NONLINEAR ALGEBRAIC EQUATIONS, REAL VARIABLES, MILITARY PUBLICATIONS, PERIODICALS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A8.

ABSTRACT: (U) Identifying the surface damage process, we studied two systems in some depth, TiO<sub>2</sub> and NiO. In TiO<sub>2</sub> there is a phase transition to TiO which spreads from the surface and is driven by oxygen desorption. This work provided the first indications that diffusion was the rate limiting step. In NiO there is no DIET, but knockon damage at higher voltages and two electron beam stimulated reaction one of which abstracts nickel and another reduction by carbon contaminants. (eq)

DESCRIPTORS: (U) \*DAMAGE ASSESSMENT, \*RADIATION DAMAGE, ABSTRACTS, CARBON, CONTAMINANTS, DAMAGE, DESORPTION, DIET, NICKEL, OXYGEN, PHASE TRANSFORMATIONS, REDUCTION, SURFACES, VOLTAGE, MILITARY PUBLICATIONS, SCIENTIFIC LITERATURE, PERIODICALS.

IDENTIFIERS: (U) PE81103D, WUAFOSR3484A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 451 7/6 11/6.1 AD-A218 450 14/2 15/5  
SOUTHERN ILLINOIS UNIV AT CARBONDALE DEPT OF MATHEMATICS PENNSYLVANIA STATE UNIV UNIVERSITY PARK  
(U) Material Instabilities in Solids. (U) Two-Dimensional Velocimetry Instrumentation.  
DESCRIPTIVE NOTE: Final rept. 1 Jun 88-31 Oct 89, Final rept. 1 Dec 88-30 Nov 89,

OCT 89

JAN 90

PERSONAL AUTHORS: Spector, Scott J.

PERSONAL AUTHORS: Santavicca, Domenic A.

CONTRACT NO. AFOSR-88-0200

CONTRACT NO. AFOSR-89-0137

PROJECT NO. 2304

PROJECT NO. 3842

TASK NO. A9

TASK NO. A1

MONITOR: AFOSR  
TR-90-0232

MONITOR: AFOSR  
TR-90-0202

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The principal investigator considered a number of mathematical problems that may help to explain material failures in certain polymers and ductile metals. In particular, useful results were obtained concerning the static instability and surface cracking of a single hole and the formation of crazes in glassy polymers. (eg)

ABSTRACT: (U) This a brief report on the acquisition and implementation of instrumentation which will be used to make two-dimensional velocimetry measurements in a study of premixed turbulent flames. Two-dimensional velocimetry. (eg)

DESCRIPTORS: (U) \*DUCTILITY, \*METALS, \*POLYMERS, \*FRACTURE(MECHANICS), \*CRACKS, \*CRAZING, GLASS, MATHEMATICS, STATIC STABILITY, SURFACES.

DESCRIPTORS: (U) \*INSTRUMENTATION, \*TWO DIMENSIONAL, \*VELOCIMETERS, ACQUISITION, FLAMES, MEASUREMENT, MIXING, REPORTS, TURBULENCE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9.

IDENTIFIERS: (U) PE61104D, WUAFOSR3842A1.

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CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

INDIANA UNIV AT BLOOMINGTON DEPT OF MATHEMATICS

(U) Preparation and Characterization of the Monomeric Copper(II) Siloxide Complex  $\text{Cu}(\text{OSi}(\text{OCMe}_3)_3)_2(\text{py})_2$ ,

(U) A Limiting Viscosity Approach for the Riemann Problem in Isentropic Gas Dynamics,

89

89

PERSONAL AUTHORS: McMullen, Anne K.; Tilley, T. D.; Rheingold, Arnold L.; Galb, Steven J.

PERSONAL AUTHORS: Stenrod, Marshall; Tzavaras, Athanasios E.

CONTRACT NO. AFOSR-88-0273

CONTRACT NO. AFOSR-87-0191, DAAL03-88-K-0185

PROJECT NO. 2303

MONITOR: AFOSR, ARO

TASK NO. B2

TR-90-0193, 26218.1-MA

MONITOR: AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28 p3772-3774 1989.

SUPPLEMENTARY NOTE: Pub. in Indiana University Mathematics Jnl., v38 n4 Winter 1989.

ABSTRACT: (U) Trialkoxysiloxy ligands,  $-\text{OSi}(\text{OR})_3$  have not been extensively employed in transition-metal chemistry. Our interest in these ligands stems from their potential to form new types of siloxy complexes with interesting chemical properties. For example,  $\text{M}-\text{OSi}(\text{OR})_3$  complexes may exhibit properties that resemble catalytic metal species supported on a silica surface. Also, such compounds may serve as convenient molecular precursors to oxide and silicate materials via hydrolysis or thermolysis. To our knowledge, the only transition-metal trialkoxysiloxy complexes that have been reported are the titanium derivatives  $(\text{RO})_3\text{TiOSi}(\text{OR})_3(\text{R}=(n)\text{Pr}(4), (i)\text{Bu}(5), ((+)\text{BuO})_3\text{TiO}(i)\text{Pr}(3))$  and  $(+)\text{BuO}(\text{SiO}_2\text{TiX}_2, \text{X}=(n)\text{Pr}(4), \text{acac}(3), \text{and the alirconium complexes } \text{Zr}(\text{OSi}(\text{O}(+)\text{Bu})_3)_4(6) \text{ and } (+)\text{BuO}(\text{SiO}_2, 2\text{ZrX}_2(\text{X}=\text{O}(i)\text{Pr})(3) \text{ acac})(8)).$

DESCRIPTORS: (U) \*LIGANDS, \*METAL COMPLEXES, \*SILOXANES, \*COPPER COMPOUNDS, CATALYSIS, CHEMICAL PROPERTIES, CHEMISTRY, HYDROLYSIS, MATERIALS, MOLECULES, OXIDES, PRECURSORS, SILICATES, SILICON DIOXIDE, SURFACES, TRANSITION METALS, ALKOXY RADICALS, PYROLYSIS, MONOMERS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, Copper Siloxide Compounds.

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## DTIC REPORT BIBLIOGRAPHY

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AD-A218 446 12/2

KANSAS STATE UNIV MANHATTAN DEPT OF CHEMISTRY

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

(U) Temperature Dependence of the Electronic-to  
Vibrational Quenching Rate Constants of  $\text{NF(b(1)Sigma(+) )}$ ,

89

PERSONAL AUTHORS: Bao, X. Y.; Setser, D. W.

PERSONAL AUTHORS: Lamm, Patricia K.; Murphy, Katherine A.

CONTRACT NO. AFOSR-88-0279

CONTRACT NO. AFOSR-88-0258, NSF-DMS82-00883

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B1

TASK NO. A1

MONITOR: AFOSR  
TR-90-0194MONITOR: AFOSR  
TR-90-0244

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
V93 n25 p8162-8170 1989.

SUPPLEMENTARY NOTE: Pub. in Quarterly of Applied  
Mathematics, V46 n1 p1-22 Mar 88. Sponsored in part by  
grants NSF-DMS86-01968, NSF-DMS82-05355, NSF-DMS85-04318  
and contracts AFOSR-84-0398, NAS1-16394 and NAS1-17130.

ABSTRACT: (U) The temperature dependence of the  
quenching rate constant of  $\text{NF(b)}$  by 18 different reagents  
has been measured in a flow reactor over the 530-200 K  
range. The rate constants for Oxygen, Hydrogen, Deuterium,  
Hydrogen Chloride Carbon dioxide and Carbon monoxide were  
fitted to an Arrhenius dependence on temperature, but the  
rate constants for the other molecules generally have a  
weaker dependence on temperature. The temperature  
dependence of the rate constant and the hydrogen-  
deuterium isotope effect for several pairs of molecules  
are discussed in terms of the expected exit channels for  
quenching by electronic-to-vibrational energy transfer.  
Reprints. (AW)

DESCRIPTORS: (U) \*QUENCHING, \*REACTION KINETICS, \*ENERGY  
TRANSFER, \*THERMOCHEMISTRY, \*NITROGEN COMPOUNDS,  
\*FLUORIDES, CARBON DIOXIDE, CARBON MONOXIDE, CHANNELS,  
CONSTANTS, DEUTERIUM, EXITS, HYDROGEN, HYDROGEN CHLORIDE,  
ISOTOPE EFFECT, MOLECULES, OXYGEN, RATES, REPRINTS,  
THERMAL PROPERTIES, ELECTRONIC STATES, MOLECULAR  
VIBRATION.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 442 7/4 21/2

NORTHERN ARIZONA UNIV FLAGSTAFF

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Human Cognitive and Motor Performance Measures under Typical Cool White Fluorescent Illumination vs Relatively High Cool White Illuminance/Irradiance Lighting.

(U) Reaction Kinetics of NH in the Shock Tube Pyrolysis of HNC0 (Isocyanic Acid),

SEP 89

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 88-30 Dec 89,

PERSONAL AUTHORS: Mertens, John D.; Chang, Albert Y.; Hanson, Ronald K.; Bowman, Craig T.

JAN 90

CONTRACT NO. AFOSR-89-0067

PERSONAL AUTHORS: Hannon, Patrick R.

PROJECT NO. 2308

CONTRACT NO. AFOSR-89-0164

PROJECT NO. 3842

TASK NO. A3

TASK NO. A4

MONITOR: AFOSR  
TR-90-0251

MONITOR: AFOSR

TR-90-0260

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Chemical Kinetics, v21 p1049-1067 1989.

ABSTRACT: (U) This study was undertaken to investigate possible practice effects and diurnal fluctuations in human motor and cognitive performances under baseline illumination conditions (400 lux). Six subjects were tested individually in order to partial out peer social interaction effects. The testing took place over a wide range of testing time epochs. Specifically, subjects were tested from 0800 to 1200 hours, 1400 to 1800 hours and 2000 to 0000 hours in a counter-balanced repeated measures design. Keywords: Test and evaluation, Test equipment. (eg)

DESCRIPTORS: (U) \*HUMANS, \*ILLUMINATION, \*COGNITION, \*PERFORMANCE(HUMAN), BASE LINES, DIURNAL VARIATIONS, MOTORS, RANGE(EXTREMES), TEST EQUIPMENT, VARIATIONS, MOTOR REACTIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR3842A4.

ABSTRACT: (U) The high temperature kinetics of NH in the pyrolysis of isocyanic acid (HNC0) have been studied in reflected shock wave experiments. Time histories of the NH radical were measured using a cw, narrow-linewidth laser absorption diagnostic at 336 nm. The second-order rate coefficients of the reactions. Isocyanic acid (HNC0) has been used in pyrolysis and photolysis experiments as a source of both the NH and NCO radicals by many investigators. In addition, HNC0 decomposition reactions and subsequent reactions of the NH radical are of interest in combustion processes such as fuel-N conversion in flames and the RAPRENDX process. The present study is aimed at measuring the rate coefficients of several reactions important in the pyrolysis of HNC0.

Keywords: Combustion. (EG)

DESCRIPTORS: (U) \*HIGH TEMPERATURE, \*ISOCYANIC ACID, \*KINETICS, COEFFICIENTS, COMBUSTION, DECOMPOSITION, FLAMES, HISTORY, PHOTOLYSIS, PYROLYSIS, RATES, REACTION KINETICS, REFLECTION, SHOCK TESTS, SHOCK TUBES, SHOCK WAVES, TIME.

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A3.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Development of a Laser Absorption Diagnostic for Shock Tube Studies of CH.

89

PERSONAL AUTHORS: Dean, Anthony J.; Hanson, Ronald K.

CONTRACT NO. AFOSR-89-0067

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR-90-0250

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Quant. Spectrosc Radiat. Transfer, v42 n5 p375-384 1989.

ABSTRACT: (U) A sensitive and quantitative diagnostic for CH based on cw laser absorption has been developed for CH kinetics experiments in a shock tube. A number of reverse transitions in the A2 Delta(V=0) yields X2 Pi(V=0) band and C2 Sigma(+)(V=0) yields X2 Pi(V=0) band which are promising for accurate CH detection were considered, leading to the selection of 431.1311 nm (vac.) as the wavelength of maximum absorption over a range of temperature from 1500 to 4000 K. This corresponds to the coincidental overlap of the Q(1d)(7) and Q(2c)(7) transitions. Reflected shock experiments involving the pyrolysis of highly dilute mixtures of ethane or methane in argon were used to verify details of the spectroscopic modelling in order to investigate the sensitivity of the method for monitoring CH. The detection limit for single-pass absorption (14.3 cm) was found to be below 0.2 ppm at 2000 K for post-shock pressures of 1 atm. This new diagnostic is well suited for studies of elementary reactions involving CH. Keywords: High temperature, Absorption coefficients, Reprints. (AW)

DESCRIPTORS: (U) \*REACTION KINETICS, \*HYDROCARBONS, \*ANALYTICAL CHEMISTRY, \*LASER APPLICATIONS, ABSORPTION, ABSORPTION COEFFICIENTS, ARGON, CONTINUOUS WAVE LASERS, DETECTION, DILUTION, ETHANES, HIGH TEMPERATURE, LASERS,

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LIMITATIONS. METHANE, MIXTURES, PYROLYSIS, REFLECTION, REPRINTS, REVERSIBLE, SHOCK, SHOCK TESTS, SHOCK TUBES, TEMPERATURE, TRANSITIONS, ABSORPTION SPECTRA, SPECTROSCOPY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A3, Laser Absorption Diagnostics.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 440 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

(U) Organosilylphosphazene Oligomers and Polymers:  
Synthesis via (Lithioaryloxy)phosphazenes.

89

PERSONAL AUTHORS: Allcock, Harry R.; Coggio, William D.;  
Archibald, R. S.; Brennan, David J.

CONTRACT NO. AFOSR-89-0234

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0248

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v22 p3571-  
3578 1989.

ABSTRACT: (U) (Lithioaryloxy)phosphazenes have been used  
as reaction intermediates for the synthesis of  
phosphazenes that bear organosilicon side groups. The  
synthetic pathways were developed at two levels, first  
with the use of small-molecule cyclic phosphazenes as  
reaction models and second with high polymeric  
phosphazenes. The cyclic small molecule N3P3(OPh)5OC6H4Br-  
(p) was first lithiated to N3P3(OPh)5OC6H4Li-(p), and  
this compound was allowed to react with a range of  
organochlorosilanes or with hexamethylcyclotrisiloxane to  
yield the species N3P3(OPh)5OC6H4R-(p), where R is SiMe3,  
SiMe2Ph, SiMePh2, SiMe2CH=CH2, SiMe2-(OSiMe2)2OSiMe2Bu,  
and SiMe2(OSiMe2)2OSiMe3. At the high polymer level, the  
macromolecule (NP-(OC6H4Br)2(n) was subjected to partial  
lithiation followed by coupling to chlorosilanes or to  
ring-opening addition of (OSiMe2)3 to generate polymers  
with OC6H5 and OC6H4Br-(p) side groups as well as OC6H4R-  
'(p) MSG DI10 LAST INPUT NOT PROCESSED. \*PLEASE  
RETRANSMIT LAST MESSAGE

DESCRIPTORS: (U) \*OLIGOMERS, \*POLYMERS, ADDITION,  
CHLOROSILANES, COUPLING(INTERACTION), MODELS, PHOSPHAZENE,  
RESPONSE, SYNTHESIS.

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STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Investigation of an Excited Jet Diffusion Flame at Elevated Pressure.

DESCRIPTIVE NOTE: Rept. for 1 Sep 84-30 Jun 89,

89

PERSONAL AUTHORS: Strawa, Anthony W.; Cantwell, Brian J.

CONTRACT NO. AFOSR-84-0373

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0193

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Fluid Mechanics, V200 p309-336 1989. Original contains color plates: All DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) Experiments have been carried out with the objective of studying the relationship between flow structure, flow excitation and the reaction process in the near field of a low-speed co-flowing jet diffusion flame. The effect of axial forcing and increasing pressure on the structure and controllability of the flame has been studied in an attempt to elucidate some of the underlying mechanisms of control. The experiments were conducted in a variable-pressure flow facility which permits the study of reacting flows at pressures ranging from 10 kPa to 1000 kPa (0.1 to 10 atmospheres). The flame was excited by adding a small-amplitude, periodic fluctuation to the central fuel jet exit velocity. The flow was visualized using an optical scheme which superimposes the luminous image of the flame on its schlieren image, giving a useful picture of the relationship between the luminous soot-laden core flow and the edge of the surrounding hot-gas envelope. Phase-conditioned velocity measurements were made with a one-component laser doppler anemometer. The excitation frequency was varied, and it was found that a narrow band of frequencies exists in which several of the

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instabilities of the flow seem to be in coincidence causing the flame to break up periodically into a series of distinct eddies. Maps of the one-dimensional velocity vector field, viewed in a frame of reference convecting with the large eddies, are used to study the topology of the flow. Reprints. (jhd)

DESCRIPTORS: (U) \*DIFFUSION, \*JET FLAMES, CONTROL, EDDIES (FLUID MECHANICS), ENVELOPE (SPACE), EXCITATION, FLAMES, FLOW, FREQUENCY, FREQUENCY BANDS, HIGH PRESSURE, HOT GASES, OPTICAL IMAGES, LUMINOSITY, NARROWBAND, NEAR FIELD, OPTICAL PROPERTIES, PRESSURE, REPRINTS, SCHLIEREN PHOTOGRAPHY, TOPOLOGY, VARIATIONS, VECTOR ANALYSIS.

IDENTIFIERS: (U) Jet Diffusion Flames, PE61102F, WUAFDSR2308A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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ROCHESTER UNIV N Y LAB FOR LASER ENERGETICS

VELOCITY.

(U) Direct Investigation of Velocity Overshoot in the Femtosecond Regime.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C1.

DESCRIPTIVE NOTE: Final rept. 1 Sep 86-31 Jan 88,

JAN 90

PERSONAL AUTHORS: Mourou, Gerard A.; Meyer, Kevin

CONTRACT NO. AFOSR-84-0318

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR  
TR-90-0207

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The study of electron transport in GaAs has been driven by two separate but related forces. The first is that since the 1960's theorists have predicted several anomalous effects that should occur in this and other III-V materials, including negative differential resistance and the Gunn effect, velocity overshoot, and most recently hot phonon effects. In parallel with these theoretical developments has been the steady increase in applications of GaAs devices in communication and computer technologies. Two specific areas in which GaAs has a distinct advantage over its more mature Si competitor are in high-speed applications, because mobilities are generally higher in the III-V materials, and in optical and electro-optic devices, which take advantage of the direct-gap and electro-optic nature of GaAs. Currently the field of GaAs electro-optic devices is expanding geometrically as researchers explore the possibilities of ultra-high-speed hybrid optoelectronic computers and the 'ultimate' possibility of an all-optical computer. (RRH)

**DESCRIPTORS:** (U) \*GALLIUM ARSENIDES, ANOMALIES, COMPUTERS, ELECTRON TRANSPORT, ELECTROOPTICS, GROUP III COMPOUNDS, GROUP V COMPOUNDS, GUNN EFFECT, HIGH TEMPERATURE, HIGH VELOCITY, HYBRID COMPUTERS, MATERIALS, NEGATIVE RESISTANCE CIRCUITS, OPTICAL EQUIPMENT, PHONONS,

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SRI INTERNATIONAL MENLO PARK CA

MICHIGAN UNIV ANN ARBOR DEPT OF STATISTICS

(U) Investigation of Schottky Barriers.

(U) Parametric Models for A sub n: Splitting Processes and Mixtures.

DESCRIPTIVE NOTE: Final technical rept. 17 Jul-31 Dec 89.

DESCRIPTIVE NOTE: Final rept. 1 Apr 87-31 Mar 89.

DEC 89

AUG 89

PERSONAL AUTHORS: Van Schilfgaarde, Mark

PERSONAL AUTHORS: Hill, Bruce M.

CONTRACT NO. F49620-86-K-0018

CONTRACT NO. AFOSR-87-0192

PROJECT NO. 2306

PROJECT NO. 2304

TASK NO. 81

TASK NO. A5

MONITOR: AFOSR  
TR-90-0204MONITOR: AFOSR  
TR-90-0212

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report summarizes the technical progress made under the auspices of AFOSR Contract F49620-86-K-0018. Substantial progress was made in two key areas: electronic structure studies of the Schottky barrier and transport studies. With respect to the electronic structure component, we applied ab initio electronic structure techniques to ideal metal-semiconductor interfaces. In a study of a sequence of metal-semiconductor contacts, we are able to address the problem of Schottky barrier pinning. Another study addresses the early stages of formation of Schottky barriers. With respect to the transport component, we developed some new techniques for treating high-field transport, in particular transport through a Schottky barrier. We also examine scattering from ionized dopants in the interstitial regions. Keywords: Hot electron transport; Schottky barriers (numerical solution to); Boltzmann equation; Transport in high fields; Band structure. (jes)

DESCRIPTORS: (U) \*ELECTRONICS, BOLTZMANN EQUATION, ELECTRON TRANSPORT, INTERFACES, INTERSTITIAL, METALS, NUMERICAL ANALYSIS, REGIONS, SCATTERING, SCHOTTKY BARRIER DEVICES, SEMICONDUCTORS, SOLUTIONS(GENERAL), TRANSPORT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306B1, LPN-SRI-2439.

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ABSTRACT: (U) A class of parametric models, called splitting processes, is defined, using de Finetti's concept of adherent mass. Such splitting processes give rise to complex mixtures of distributions. It is proved that the nonparametric Bayesian predictive procedure, A sub n, of Hill (1968), holds exactly for a member of this class called a nested splitting process. It is also shown that the generalization of A sub n, called H sub n, to deal with ties, can hold exactly. A multivariate version of A sub n, based upon the splitting processes, is proposed. Some general considerations concerning ties and adherent masses are discussed, as well as their connection with the Dirichlet process. These include the phenomenon by which in the Dirichlet process, the posterior predictive mass builds up at the observed points, while under A sub n no mass is given to the observed points, and under H sub n some but not necessarily all posterior predictive mass builds up at the observed points. A very general class of splitting processes is then defined, which allows for some of the adherent mass at a point to be replaced by an exact tie. It is proved that both the Dirichlet process of Ferguson and A sub n can arise as different special cases of this general model. (kr)

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*PARAMETRIC

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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ANALYSIS, DIRICHLET INTEGRAL, MIXTURES.

MICHIGAN UNIV ANN ARBOR DEPT OF STATISTICS

IDENTIFIERS: (U) WUAFOSR2304A5, PE61102F.

(U) A Theory of Bayesian Data Analysis.

DESCRIPTIVE NOTE: Final rept. 1 Apr 87-31 Mar 89,

OCT 89

PERSONAL AUTHORS: Hill, Bruce M.

CONTRACT NO. AFOSR-87-0192

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0213

UNCLASSIFIED REPORT

ABSTRACT: (U) Bayesian data analysis is concerned with the type of data manipulations, transformations, and just plain playing with the data, that any serious scientist engages in during the statistical (or other) analysis of his data. It is largely a post-data procedure, rather than a pre-data procedure, since even when it is desirable to think through such matters quite carefully prior to obtaining the data, in many real world experiments time and other constraints would provide limits on such activities. Compare Hacking or the discussion in Hodges concerning how much is enough. Bayesian data analysis goes beyond the mere data manipulations, however, and attempts to integrate the theory of subjective probability with such data analysis. In this respect it differs from other data-analytic approaches, which appear, more or less, to abandon probability. In this article the author attempts further to elucidate the theory of Bayesian data analysis begun in Hill. (kr)

DESCRIPTORS: (U) \*BAYES THEOREM, \*DATA PROCESSING, \*STATISTICAL ANALYSIS, PROBABILITY, SCIENTISTS, THEORY, TIME.

IDENTIFIERS: (U) WUAFOSR2304A5, PE61102F.

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BROWN UNIV PROVIDENCE RI DIV OF APPLIED MATHEMATICS

ROCHESTER UNIV N Y LAB FOR LASER ENERGETICS

(U) Numerical Methods and Approximation and Modelling Problems in Stochastic Control Theory.

(U) Time-Resolved Surface Structural Study by Picosecond Reflection High-Energy Electron Diffraction.

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-29 Nov 88,

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-31 Jan 89,

NOV 88

MAR 89

PERSONAL AUTHORS: Fleming, Wendell H.; Kushner, Harold J.

PERSONAL AUTHORS: Elsayed, Hani E.

CONTRACT NO. AFOSR-85-0315

CONTRACT NO. AFOSR-87-0327

PROJECT NO. 2304

PROJECT NO. 2306

TASK NO. A1

TASK NO. B1

MONITOR: AFOSR  
TR-90-0210MONITOR: AFOSR  
TR-90-0205

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This is a summary of research completed during the period of this award, 1 October 1985-30 September 1988 by Fleming, Kushner together with associated postdoctoral and graduate student personnel. The research covers a number of problems in many areas of stochastic control, recursive stochastic algorithms, and related areas of analysis. It is part of a continuing research program pursued successfully for a number of years. The program has been motivated both by traditional applications in control and filtering and by newer areas of application arising in queueing/communication networks and production systems. Other research issues addressed include numerical methods for stochastic control and recursive algorithms for distributed and parallel processing and/or control. The work of Fleming and Kushner will be summarized in turn, with references to research publications supported under this award: (kr)

DESCRIPTORS: (U) \*CONTROL THEORY, \*NUMERICAL METHODS AND PROCEDURES, \*STOCHASTIC CONTROL, ALGORITHMS, COMMUNICATIONS NETWORKS, DISTRIBUTED DATA PROCESSING, DOCUMENTS, PARALLEL PROCESSING, PERSONNEL, PRODUCTION, QUEUEING THEORY, RECURSIVE FUNCTIONS, STOCHASTIC PROCESSES, STUDENTS.

IDENTIFIERS: (U) WJAFOSR2304A1, PE81102F.

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ABSTRACT: (U) The objective of this program was to develop an instrument for characterization of nanosecond and picosecond time evolution of surface properties. This instrument was developed based on the technique of picosecond time-resolved reflection high-energy electron diffraction (RHEED). The basic idea of this technique is the utilization of 150 ps laser pulses to generate electron pulses by the photoelectric effect. The photogenerated electrons are accelerated, focused, and collimated using electron optics. Only a very small fraction of the laser pulse energy is needed to generate the fast (10-30 kV) well-collimated electron pulses; thus, most of the laser energy is available for sample irradiation. (eg)

DESCRIPTORS: (U) \*ELECTRON DIFFRACTION, \*ELECTRON ENERGY, \*HIGH ENERGY, \*REFLECTION, ELECTROMAGNETIC PULSES, ELECTRON OPTICS, ENERGY, EVOLUTION(GENERAL), IRRADIATION, LASERS, LIGHT PULSES, PHOTOELECTRIC EFFECT, PULSED LASERS, STRUCTURAL PROPERTIES, SURFACE PROPERTIES, SURFACES, TIME.

IDENTIFIERS: (U) WJAFOSR2308B1, PE61102F.

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NORTH CAROLINA UNIV AT CHAPEL HILL SCHOOL OF MEDICINE

WICHITA STATE UNIV KS DEPT OF MATHEMATICS AND STATISTICS

(U) Auditory Spectro-Temporal Pattern Analysis.

(U) Free Boundary Problems for Flow With Vorticity.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-31 Oct 89.

DESCRIPTIVE NOTE: Final rept. 1 May-31 Dec 89.

FEB 90

DEC 89

PERSONAL AUTHORS: Hall, Joseph W.

PERSONAL AUTHORS: Elcrat, Alan R.

CONTRACT NO. AFOSR-87-0083

CONTRACT NO. AFOSR-89-0323

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. A6

TASK NO. A9

MONITOR: AFOSR  
TR-90-0267

MONITOR: AFOSR  
TR-90-0265

UNCLASSIFIED REPORT

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ABSTRACT: (U) The project period spanned November 1, 1986 through October 31, 1989. The Major aims of the project were to establish what aspect of the across-frequency modulation pattern is utilized to obtain release from masking in modulated noise; to determine whether CMR occurs for multi-component signals (as contrasted with puretone signals used for previous investigations); to determine whether CMR may apply to comodulation signals (in contrast with comodulated maskers used in previous investigations); to examine the possible relation between CMR and the MLD; and to examine the possible relations between CMR and temporal resolution. Keywords: Noise auditory signals; Sound discrimination; Sound pattern analysis. (KT)

DESCRIPTORS: (U) \*AUDITORY SIGNALS, \*MODULATION, \*AUDITORY PERCEPTION, \*PATTERN RECOGNITION, \*SOUND, DISCRIMINATION, MASKING, NOISE, SIGNALS.

IDENTIFIERS: (U) WUAFOSR2313A6, PE61102F.

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ABSTRACT: (U) The research centered on the study of inviscid flows with concentrated regions of vorticity. There were related studies of numerical conformal mapping and construction of minimal surfaces. The flows past a class of three dimensional bodies was studied using matched asymptotic expansions. The near field was computed using a wake theory developed earlier and the far field was obtained from a superposition of a distribution of vorticity and sources on a line segment. In another paper a class of flows with constant vorticity regions were computed from a variational principle which had been used earlier in theoretical work for such flows. Scattering of electromagnetic waves from a dielectric slab with time varying permittivity was studied, and the Gauss Map was used to construct a new class of minimal surfaces which become vertical on a part of the bounding curve. (jhd)

DESCRIPTORS: (U) \*INVISCID FLOW, \*VORTICES, ASYMPTOTIC SERIES, BOUNDARY VALUE PROBLEMS, CONFORMAL MAPPING, DIELECTRIC PROPERTIES, DIELECTRICS, DISTRIBUTION, ELECTROMAGNETIC RADIATION, ELECTROMAGNETIC SCATTERING, EXPANSION, FAR FIELD, MATCHING, NEAR FIELD, NUMERICAL ANALYSIS, REGIONS, THEORY, THREE DIMENSIONAL, TIME, VARIATIONAL PRINCIPLES, WAKE.

IDENTIFIERS: (U) Matched Asymptotic Expansion.

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WUAFOSR2304A9, PE61102F.

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VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Ab initio Study of CN- Impurity Centers in Alkali Halides: Lattice Stabilization of Excited Electronic States.

NOV 89

PERSONAL AUTHORS: Tellinghuisen, Joel; Ewig, Carl S.

CONTRACT NO. F49620-86-C-0125, SAFOSR-86-0146

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0128

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v91  
n9 p5476-5488, 1 Nov 89.

ABSTRACT: (U) The lowest four electronic states in the cyanide anion were calculated at the multiconfiguration self-consistent field (MCSF) level using point-charge models to the ionic environment in cubic alkali halide crystals. The electrostatic potential of the lattice is essential to stabilize the excited states against auto detachment, yet the resulting spectroscopic properties are remarkably insensitive to gross changes in the lattice. The lowest excited state, observed in the UV emission spectrum of CN(-) centers in some alkali halides, is shown to be triplet-sigma. The properties of the ground state were further examined at the SCF level in clusters of six alkali ions. The cations cause a compression of the anion, decreasing the internuclear distance and increasing the vibrational frequency, improving agreement with experiment. An examination was also made of mathematical techniques to extract spectroscopic constants from pointwise tabulated potentials, such as result from the MCSCF computations, employing closed-form potential functions. Reprints. (AW)

DESCRIPTORS: (U) \*ALKALI METAL COMPOUNDS, \*CYANIDES, \*ELECTRONIC STATES, \*HALIDES, \*IMPURITIES, \*CRYSTAL LATTICES, ANIONS, CATIONS, COMPRESSION, COMPUTATIONS,

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CONFIGURATIONS, CONSISTENCY, ELECTROSTATICS, EMISSION SPECTRA, FUNCTIONS, GROUND STATE, IONS, MATHEMATICAL ANALYSIS, REFRINTS, SENSITIVITY, SPECTROSCOPY, TABULATION PROCESSES, ULTRAVIOLET SPECTRA, VIBRATIONAL SPECTRA, STABILIZATION.

MARYLAND UNIV COLLEGE PARK DEPT OF PHYSICS AND ASTRONOMY  
(U) Chopper for Neutrinos and Antineutrinos.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Dec 88,

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Ab Initio Calculations..

OCT 89

PERSONAL AUTHORS: Weber, J.

CONTRACT NO. F49620-87-C-0112

PROJECT NO. 4099

TASK NO. 09

MONITOR: AFOSR  
TR-90-0080

UNCLASSIFIED REPORT

ABSTRACT: (U) A new approach to weak interaction physics employs detectors which are nearly perfect single crystals, with high Debye temperatures. Total scattering cross sections are proportional to the square of the total number of quarks. Available sources of antineutrinos exert macroscopic forces on such crystals as a result of elastic scattering. In this paper a chopper is described for modulating the antineutrino forces, in order to excite normal modes of elastic solids. Experiments are reported. Keywords: Neutrinos; Weak interactions. (jhd)

DESCRIPTORS: (U) \*PARTICLE COUNTERS, \*NEUTRINOS, \*SCATTERING CROSS SECTIONS, ANTIPARTICLES, ELASTIC PROPERTIES, ELASTIC SCATTERING, SINGLE CRYSTALS.

IDENTIFIERS: (U) Antineutrinos, Weak Interactions, Debye Temperature, PE61102F, WUAFOSR409909.

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WASHINGTON UNIV SEATTLE DEPT OF CIVIL ENGINEERING

(U) Dynamic Fracture of Concrete. Part 1.

DESCRIPTIVE NOTE: Final rept. 15 Jun 88-14 Dec 89,

FEB 90

PERSONAL AUTHORS: Du, Jiaji.; Hawkins, Neil M.; Kobayashi, A. S.

REPORT NO. UNAF/DCE/TR-90/1-PT-1

CONTRACT NO. AFOSR-86-0204

PROJECT NO. 2303

TASK NO. C2

MONITOR: AFOSR  
TR-90-0209

IDENTIFIERS: (U) PE61102F, WUAFOSR2302C2.

UNCLASSIFIED REPORT

ABSTRACT: (U) Static and dynamic analyses of concrete failure based on fracture mechanics were conducted using crack-line wedge-loaded, double cantilever beam (CLWL-DCB) and edge-cracked, three point bend specimens under Mode I loading conditions, aimed at developing a mathematical model which describes the tensile failure process of concrete materials at the macro-level. The fracture process zone associated with a stably growing crack in concrete was determined by a hybrid experimental-numerical technique where a crack closure stress versus crack opening displacement (COD) relation of a finite element model of the specimen was optimized to fit the COD data, obtained by Moire interferometry with real reference grating, and other experimental measurements. For the first time, the crack closure stress versus COD relation of a fracture process zone in concrete was determined directly and was found to be similar to those obtained by others using inverse procedures. The crack closure stress versus COD relation for the two CLWL-DCB and edge-cracked, three point bend specimens were identical thus implying that this relation is a specimen-independent but material-dependent constitutive relation. The above static constitutive relation, with modifications to account for the differences in tensile

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GENERAL ELECTRIC CO SCHENECTADY NY RESEARCH AND  
DEVELOPMENT CENTER

(U) Assessment of a Partial-Equilibrium/Monte Carlo Model  
for Turbulent Syngas Flames.

88

PERSONAL AUTHORS: Correa, S. M.; Gulati, A.

CONTRACT NO. F49620-85-C-0035

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-80-0184

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v72  
p159-173 1988.

ABSTRACT: (U) Calculations and data for a turbulent jet  
flame of 40% CO, 30% H<sub>2</sub>, and 30% N<sub>2</sub> in coflowing air are  
compared extensively. The calculations are based on a  
partial-equilibrium model for the oxyhydrogen radical  
pool including CO, and on a velocity-composition joint  
probability density function (pdf), which closes the  
turbulent flux and mean chemical source terms. The pdf is  
joint between the three velocity components and two  
thermochemical scalars needed to describe partial-  
equilibrium conditions. The equation is solved  
numerically by a Monte Carlo technique. The data used are  
major species concentrations and temperature from pulsed  
Raman scattering. Difficulties with Raman measurements at  
high temperatures and of measuring CO<sub>2</sub> directly are  
discussed. The Raman signals are taken from previous  
studies but here are corrected for high-temperature  
effects and CO<sub>2</sub> vibrational spectra. Temperatures  
obtained from the instantaneous density of the ma-  
species rather than from the Stokes/anti-Stokes r-  
which is more affected by chemiluminescence. The  
agreement between the model and the data is more  
favorable to the partial-equilibrium model than  
previously thought. The relative simplicity of the  
partial-equilibrium model makes it a candidate for

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practical calculations. Keywords: Turbulent diffusion  
flames; Partial equilibrium; Modeling; Laser Raman  
spectroscopy; Reprints. (jhd)

DESCRIPTORS: (U) \*SYNTHETIC FUELS, \*TURBULENT DIFFUSION,  
\*JET FLAMES, CHEMILUMINESCENCE, DENSITY,  
EQUILIBRIUM(GENERAL), FLAMES, FLUX(RATE), HIGH  
TEMPERATURE, LIGHT SCATTERING, MEASUREMENT, MONTE CARLO  
METHOD, LIGHT PULSES, RAMAN SPECTRA, RAMAN SPECTROSCOPY,  
REPRINTS, SIGNALS, STOKES RADIATION, THERMOCHEMISTRY.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

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PURDUE UNIV LAFAYETTE IN

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL ENGINEERING

(U) Asynchronous Optical Sampling: A New Combustion Diagnostic for Potential Use in Turbulent, High-Pressure Flames.

MAR 89

88

PERSONAL AUTHORS: Kneisler, R. J.; Lytle, F. E.; Flechtner, G. J.; Jiang, Y.; King, G. B.

PERSONAL AUTHORS: Ghoniem, Ahmed F.; Krishnan, Anantha

CONTRACT NO. AFOSR-84-0323

CONTRACT NO. AFOSR-84-0336

PROJECT NO. 2308

PROJECT NO. 2308

TASK NO. A2

TASK NO. A2

MONITOR: AFOSR  
TR-90-0186MONITOR: AFOSR  
TR-90-0175

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Optics Letters, v14 n5 p260-262, 1 Mar 89.

SUPPLEMENTARY NOTE: Pub. in Symposium (International) on Combustion/The Combustion Institute (22nd) p665-675 1988.

ABSTRACT: (U) Asynchronous optical sampling (ASOPS) is a pump-probe method that has strong potential for use in turbulent, high-pressure flames. We show that rapid measurement of species number density can be achieved by maintaining a constant beat frequency between the model-locking frequencies of the pump and probe lasers. We also describe the instrumental timing parameters for ASOPS and consider the optimization of these parameters.

Measurement of the nanosecond decay for electronically excited sodium in an atmospheric flame demonstrates the viability of the ASOPS technique in highly quenched flame environments. Keywords: Reprints; Probe spectroscopy; Combustion; Laser diagnostics; Stimulated emission. (JHD)

DESCRIPTORS: (U) \*FLAMES, \*TURBULENCE, ASYNCHRONOUS SYSTEMS, BEAT SIGNALS, COMBUSTION, DENSITY, DIAGNOSIS(GENERAL), HIGH PRESSURE, LASER APPLICATIONS, LASER BEAMS, MEASUREMENT, OPTICAL PROPERTIES, OPTIMIZATION, PARAMETERS, PROBES, QUENCHING, REPRINTS, SAMPLING, SODIUM, EMISSION SPECTROSCOPY, TIMING DEVICES.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F, ASOPS(Asynchronous Optical Pumping).

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augments the overall volumetric entrainment into the eddy core, and causes an entrainment asymmetry with a bias towards the products. The generated vorticity extends the growth period of the eddy and imparts on it an extra mean convective motion. Reprints. (Jhd)

DESCRIPTORS: (U) \*ARRHENIUS EQUATION, \*COMBUSTION, \*REACTION KINETICS, ASYMMETRY, BOUNDARIES, CONVECTION(HEAT TRANSFER), CORES, DENSITY, EDDIES(FLUID MECHANICS), ENTRAINMENT, FLAMES, FLOW, FLOW FIELDS, GRADIENTS, HEAT, HIGH RATE, INTERACTIONS, LAGRANGIAN FUNCTIONS, LAMINAR FLOW, LAYERS, LENGTH, MATHEMATICAL MODELS, MEAN, MIXING, MOTION, NUMERICAL ANALYSIS, RATES, REACTION TIME, RELEASE, REPRINTS, REYNOLDS NUMBER, ROLL, SHEAR PROPERTIES, SIMULATION, THICKNESS, TRANSPORT, VELOCITY, VORTICES.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL ENGINEERING

(U) Numerical Simulation of a Thermally Stratified Shear Layer Using the Vortex Element Method.

NOV 88

PERSONAL AUTHORS: Ghoniem, Ahmed F.; Heidarinia, Ghassem; Krishnan, Anantha

CONTRACT NO. AFOSR-84-0356

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0177

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Computational Physics, v79 n1 p135-166 Nov 88.

ABSTRACT: (U) In computing the development of an unstable inviscid shear layer, it is found that using a fixed number of vortex elements can lead to large errors due to the strong strain field which develops and acts to distort the original vorticity contours. It is suggested that the vorticity should be redistributed among elements which are arranged in the local principal direction of strain in order to capture this distortion accurately. Mixing within an initially stratified layer, which results from the combined action convection and diffusion, is computed using a similar scheme to integrate the energy equation. Calculations illustrate the evolution of the temperature profile during the growth of the instability. Reprints. (JHD)

DESCRIPTORS: (U) \*CONVECTION, \*INVISCID FLOW, \*LAYERS, \*DIGITAL SIMULATION, \*SHEAR PROPERTIES, \*VORTICES, CONTOURS, DISTORTION, ENERGY, EQUATIONS, GROWTH(GENERAL), HEAT, PROFILES, REPRINTS, STABILITY, STRATIFICATION, TEMPERATURE.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

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STANFORD UNIV CA

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Molecular Velocity Imaging of Supersonic Flows Using Pulsed Planar Laser-Induced Fluorescence of NO.

(U) An Investigation of the Structure of a Laminar Non-Premixed Flame in an Unsteady Vortical Flow.

DESCRIPTIVE NOTE: Journal article,

DESCRIPTIVE NOTE: Rept. Jan 85-Jan 88,

MAY 89

88

PERSONAL AUTHORS: Paul, P. H.; Lee, M. P.; Hanson, R. K.

PERSONAL AUTHORS: Lewis, G. S.; Cantwell, B. J.; Vandsburger, U.; Bowman, C. T.

CONTRACT NO. AFOSR-89-0067

CONTRACT NO. AFOSR-84-373

PROJECT NO. 2308

PROJECT NO. 2308

TASK NO. A3

TASK NO. A2

MONITOR: AFOSR TR-80-0253

MONITOR: AFOSR TR-90-0182

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Optics Letters, v14 n9 p417-419, 1 May 89.

SUPPLEMENTARY NOTE: Pub. in Symposium (International) on Combustion/The Combustion Institute (22nd) p515-522 1988. Original contains color plates: All DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) A technique is described for imaging components of velocity in a gaseous flow field by using pulsed planar laser-induced fluorescence. The technique is based on the fluorescence detection of Doppler-shifted absorption that results when a spectrally narrow absorption line is excited with a broadband laser. Results obtained in a Mach 7 underexpanded supersonic jet, seeded with Nitric Oxide, are presented. The practical extension of this technique to single-shot measurements of two velocity components is discussed. Reprints. (AW)

ABSTRACT: (U) Although organized vortical motions have been observed in a variety of turbulent flames, there have been only a few experimental studies which have directly examined the structure of a flame imbedded in an unsteady vortical flow. In the present work, this problem is investigated using a laminar co-flowing jet flame in which a periodic vortical motion is induced by acoustic excitation of the fuel stream. A variety of optical planar imaging techniques are employed to define the instantaneous flame structure. Particle tracking is used to obtain the instantaneous two-dimensional velocity field. These measurements are combined to follow the evolution of the flame in the unsteady velocity field over one cycle of the excitation. The flame is observed to break up into a series of axisymmetric flamelets which convect and distort under the influence of buoyancy and the vortical flow. When the velocity field is viewed in a frame of reference moving with the flamelets the flow pattern is seen to consist of a pair of saddle points on either side of the flow centerline near the flame tip and

DESCRIPTORS: (U) \*FLOW FIELDS, \*NITROGEN OXIDES, \*SUPersonic FLOW, ABSORPTION, ABSORPTION SPECTRA, BROADBAND, DETECTION, DOPPLER EFFECT, FLUORESCENCE, GAS FLOW, IMAGES, LASER INDUCED FLUORESCENCE, LASERS, LINE SPECTRA, MEASUREMENT, MOLECULES, PLANAR STRUCTURES, PULSES, REPRINTS, SPECTRA, VELOCITY, SEEDING.

IDENTIFIERS: (U) WJAFOSR2308A3, PE61102F.

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a single saddle point on the centerline near the base of the flame. This latter saddle point is also evident in images of light scattered from TiO2 particles added to the fuel stream. Entrained fluid is fed into a large axisymmetric vortex surrounding the base of the flame. Because of heat release, the flame acts as an effective volume source in the flow. A high strain rate exists on the centerline at the base of the flame, and planar laser-induced fluorescence measurements of the concentration of OH show local extinction of the flame. Reprints. (jhd)

DESCRIPTORS: (U) \*FLAMES, \*TURBULENT FLOW, \*VORTICES, ACOUSTIC WAVES, AXISYMMETRIC, BUOYANCY, CYCLES, ENTRAINMENT, EVOLUTION(GENERAL), EXCITATION, EXPERIMENTAL DATA, EXTINCTION, FUELS, HEAT, OPTICAL IMAGES, LASER INDUCED FLUORESCENCE, MEASUREMENT, METHODOLOGY, MOTION, OPTICS, PARTICLES, PATTERNS, PLANAR STRUCTURES, RELEASE, REPRINTS, TRACKING, TWO DIMENSIONAL FLOW, UNSTEADY FLOW.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

NIELSEN ENGINEERING AND RESEARCH INC MOUNTAIN VIEW CA  
(U) A Study of Supermaneuver Aerodynamics.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-1 Dec 89,

JAN 90

PERSONAL AUTHORS: Nixon, David; Rodman, Laura C.

CONTRACT NO. F49620-88-C-0006

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-90-0269

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this work is to develop a novel technique for studying transient separated flows, such as those typical for maneuvering aircraft. The ultimate goal of this research is to develop flow control techniques using the boundary conditions in a Navier Stokes calculation. Once numerical boundary conditions are established, then their physical counterparts may be found. A subdomain technique was developed which allows the study of the effects of various boundary conditions on a local portion of the flowfield. A search technique, using artificial intelligence methods, was developed and was used to find the combination of boundary conditions that achieved the desired flow control. In addition, a two-dimensional boundary conditions theory for the steady Euler and Navier Stokes equations was derived. A wide range of boundary conditions for the subdomains were tried without significant success. However, a boundary condition, based on Duhamel's equation, was found to be very promising in leading to a reduction of computer time. (JHD)

DESCRIPTORS: (U) \*FLIGHT MANEUVERS, \*FLOW SEPARATION, AERODYNAMICS, AIRCRAFT, ARTIFICIAL INTELLIGENCE, BOUNDARY VALUE PROBLEMS, COMPUTATIONS, COMPUTERS, FLOW FIELDS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, RANGE(EXTREMES), REDUCTION, STEADY STATE, THEORY, TIME, TRANSIENTS, BOUNDARY LAYER CONTROL, TWO DIMENSIONAL FLOW.

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WASHINGTON UNIV SEATTLE DEPT OF CIVIL ENGINEERING

IDENTIFIERS: (U) WUAFOSR3005A1, PE65502F, Duhamel  
Equation, Euler Equations.

(U) Dynamic Fracture of Concrete. Part 2.

DESCRIPTIVE NOTE: Final rept. 15 Jun 86-14 Dec 89,

FEB 90

PERSONAL AUTHORS: Yon, Jung H.; Hawkins, Neil M.;  
Kobayashi, A. S.

CONTRACT NO. AFOSR-86-0204

PROJECT NO. 2302

TASK NO. C2

MONITOR: AFOSR  
TR-90-0208-PT-2

UNCLASSIFIED REPORT

ABSTRACT: (U) A displacement controlled dynamic test system and instrumentation for dynamic fracture testing of concrete specimens, was developed. Also a hybrid experimental-numerical procedure for evaluating the dynamic fracture data thus generated was developed. The experimental data consisted of the applied load and transient strains in single edge notched, three point bend specimens which were subjected to controlled displacement loading. In addition, moire interferometry data was obtained in three point bend specimens subjected drop weight loading. Also the applied load, transient strains and crack opening displacement were measured in crack-line wedge-loaded, double cantilever beam specimens which were subjected to controlled wedge displacement loading. These test systems and the hybrid analysis were used to determine the strain rate sensitivity of the elastic properties and the fracture process zone of rapidly fracturing concrete specimens. The increase in both tensile and compressive moduli of elasticity and the tensile strength with increasing strain rate were quantified. The fracture process zone decreased in magnitude with increasing strain rate but the tensile strength necessary to propagate the tip of the fracture process zone under a tensile strength criterion increased substantially with the strain rate. The net effect was that dynamic fracture responses of a rapidly propagating

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crack in concrete resembled that of linear elasto-dynamic fracture mechanics with influence of the fracture process zone decreasing with increasing strain rate of loading. (sdw)

DESCRIPTORS: (U) \*CONCRETE, \*FRACTURE(MECHANICS), BEAMS(STRUCTURAL), CANTILEVER BEAMS, COMPRESSIVE PROPERTIES, CONTROL, CRACKS, DISPLACEMENT, DROP TESTS, DYNAMIC RESPONSE, DYNAMIC TESTS, DYNAMICS, ELASTIC PROPERTIES, EXPERIMENTAL DATA, HYBRID SIMULATION, HYBRID SYSTEMS, INTERFEROMETRY, MOIRE EFFECTS, NUMERICAL METHODS AND PROCEDURES, OPENING(PROCESS), PROPAGATION, SENSITIVITY, STRAIN RATE, TENSILE PROPERTIES, TENSILE STRENGTH, TEST AND EVALUATION, WEDGES, WEIGHT.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2302C2.

SYSTEMS ENGINEERING INC GREENBELT MD

(U) Nonlinear Dynamics and Control of Flexible Structures.

DESCRIPTIVE NOTE: Annual rept. Sep 87-Aug 88,

NOV 88

PERSONAL AUTHORS: Bennett, W. H.; Kwatny, H. G.; Blakeship, G. L.; Akhrif, O.

REPORT NO. SEI-88-11-15-WB

CONTRACT NO. F49620-87-C-0103

PROJECT NO. 0812

TASK NO. K1

MONITOR: AFUSR  
TR-90-0201

UNCLASSIFIED REPORT

ABSTRACT: (U) The unprecedented requirements for rapid retargeting and precision pointing for spaced-based directed energy weapon platforms is the prime driver behind the reported modeling and control study. The combination of such requirements demand a comprehensive dynamic model of the nonlinear multibody dynamics of typical space platforms for such weapon including the interaction platform structural flexure effecting the principal weapon system effective Line-Of-Sight. This report describes the first year effort of a three year project which focuses on: (1) the development of comprehensive; generic nonlinear dynamical models for typical space-based platform forms, (2) the development of high performance, nonlinear control laws for rapid slewing and precession pointing of primary weapon system payload apertures, and (3) the design of a series of laboratory experiments to verify and test the control laws developed. The validation of the analytical models and the required control theory for the resulting class of nonlinear system is described in this report. Simulation results are given for a simplified benchmark model of a space-based laser slewing control and consideration for compensation for structural flexure effecting optical LOS using optical steering mirrors is

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discussed. (sdw)

DESCRIPTORS: (U) \*CONTROL THEORY, \*FLEXIBLE STRUCTURES, \*MATHEMATICAL MODELS, AIMING, BODIES, CONTROL SYSTEMS, DYNAMICS, FLEXURAL PROPERTIES, INTERACTIONS, LABORATORY TESTS, LASERS, LINE OF SIGHT, MIRRORS, MODELS, NONLINEAR SYSTEMS, OPTICAL EQUIPMENT, OPTICAL PROPERTIES, PLATFORMS, PRECISION, REQUIREMENTS, SIMULATION, SLEWING, SPACE BASED, SPACECRAFT, STEERING, STRUCTURAL PROPERTIES, TARGETING, VALIDATION, WEAPON SYSTEMS.

IDENTIFIERS: (U) PE61102F, WUAFOSR0812K1.

AD-A218 370 20/4

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF AERONAUTICS AND ASTRONAUTICS

(U) Unsteady Flow Phenomena in Turbomachines.

DESCRIPTIVE NOTE: Final rept. 19 Oct 87-18 Oct 89.

JAN 90

PERSONAL AUTHORS: Greitzer, Edward M.; Epstein, Alan H.; Giles, Michael B.; McCune, James E.; Tan, Choon S.

CONTRACT NO. F49620-85-C-0018

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-90-0217

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes work carried out at the Gas Turbine Laboratory at M.I.T. as part of our multi-investigator effort on basic unsteady flow phenomena. Within the overall project, four separate tasks are specified. These are, in brief: I. Unsteady Flow in Compressors; II. Computational Techniques for Unsteady Flows; III. Unsteady Phenomena, Inlet Distortion, and Flow Instabilities in Multistage Compressors; IV. Unsteady Vortical Wakes Behind Blade Rows - Prediction of Relationships with Blade Properties. Computational fluid mechanics; Unsteady flows in turbomachines; Vortex wakes; Compressor stability; Transonic compressors. (jes)

DESCRIPTORS: (U) \*FLUID MECHANICS, BLADES, COMPRESSORS, COMPUTATIONS, DISTORTION, GAS TURBINES, INLETS, LABORATORIES, PREDICTIONS, STABILITY, STAGING, TURBOMACHINERY, UNSTEADY FLOW, VORTICES, WAKE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A4.

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STANFORD UNIV CA DEPT OF PSYCHOLOGY

(U) Decision under Conflict: Resolution and Confidence in Judgment and Choice.

DESCRIPTIVE NOTE: Annual technical rept. no 1, 1 Nov 88-30 Nov 89,

JAN 90

PERSONAL AUTHORS: Tversky, Amos

CONTRACT NO. AFOSR-89-0064

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-90-0231

UNCLASSIFIED REPORT

ABSTRACT: (U) A constructive approach to the analysis of judgement and choice maintains that the decision maker does not always have well-defined preferences and beliefs. Instead, they are often constructed in the elicitation process. This approach is used to explain and interpret a variety of phenomena that violate the classical theory of rational choice. It also leads to the formulation of psychological principles that govern judgment and choice. The present report summarizes three research projects conducted within the constructivist framework. The first project investigates the compatibility principle according to which the weighting of a stimulus attribute is enhanced by its compatibility with the response. Keywords: Psychology; Compatibility; Evidence; Ambiguity; Competence. (EG)

DESCRIPTORS: (U) \*PSYCHOLOGY, COMPATIBILITY, JUDGEMENT(PSYCHOLOGY), THEORY.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A4.

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CINCINNATI UNIV OH DEPT OF AEROSPACE ENGINEERING AND ENGINEERING MECHANICS\*

(U) Approximate Evaluation of Reliability and Related Quantities via Perturbation Techniques.

DESCRIPTIVE NOTE: Final rept. 15 Feb 88-14 Feb 89,

JUL 89

PERSONAL AUTHORS: Walker, Bruce K.; Srichander, Ramaswamy

CONTRACT NO. AFOSR-88-0131

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0268

UNCLASSIFIED REPORT

ABSTRACT: (U) Reliability evaluation of fault tolerant control systems (FTCS) that include sequential tests for failure detection and identification involve the transient analysis of finite-state semi-Markov chains of very large dimension. Such models for the time horizons of interest are intractable even for simple architectures. This has motivated the work summarized in this report as well as the work that was accomplished under a previous AFOSR grant. The basis for the work is the idea of asymptotic aggregation of semi-Markov chains that include slow and fast transitions. The extension of earlier asymptotic aggregation results (primarily due to Korolyuk) to models that include decomposed classes that are non-ergodic and the subsequent application of these results to FTCS models was the subject of studies conducted under the previous grant. The research efforts reported here concentrate on the application of the results from the previous study to more general FTCS architectures. (KR)

DESCRIPTORS: (U) \*CONTROL SYSTEMS, \*PERTURBATIONS, \*FAULT TOLERANT COMPUTING, \*SYSTEMS ANALYSIS, \*STATISTICAL TESTS, ARCHITECTURE, CHAINS, DETECTION, FAILURE, FAULTS, MARKOV PROCESSES, RELIABILITY, SEQUENTIAL ANALYSIS, SIZES(DIMENSIONS), TEST AND EVALUATION, TOLERANCE, TRANSIENTS, TRANSITIONS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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IDENTIFIERS: (U) PE61102F, WJAFOSR2304A5.  
NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) Homogeneous Chaos, p-Forms, Scaling and the Feynman Integral.

DESCRIPTIVE NOTE: Technical rept.,

SEP 89

PERSONAL AUTHORS: Johnson, G. W.; Kallianpur, G.

REPORT NO. TR-274

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0277

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Nebraska Univ., Lincoln. Department of Mathematics and Statistics.

ABSTRACT: (U) Interesting questions concerning homogeneous chaos, scaling and the Feynman integral have been brought to light in a recent largely heuristic but fascinating paper of Hu and Meyer. Our purpose is to indicate a way of resolving these questions as well as others which have arisen in the course of our research. Keywords: Stochastic processes. (KR)

DESCRIPTORS: (U) \*INTEGRALS, HEURISTIC METHODS, STOCHASTIC PROCESSES.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A5, \*Feynman integral.

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NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) Slepian Models and Regression Approximations in Crossing and Extreme Value Theory.

DESCRIPTIVE NOTE: Technical rept.,

JAN 90

PERSONAL AUTHORS: Lindgren, Georg; Rychlik, Igor

REPORT NO. TR-282

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-90-0276

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Colorado State Univ., Fort Collins, CO. Department of Statistics.

ABSTRACT: (U) In crossing theory for stochastic processes the distribution of quantities such as distances between level crossing, maximum height of an excursion between level crossing, amplitude and wavelength, etc., can only be written in the form of infinite dimensional integrals, which are difficult to evaluate numerically. A Slepian model is an explicit random function representation of the process after a level crossing and it consists of one regression term and one residual process. The regression approximation of a crossing variable is defined as the corresponding variable in the regression term of the Slepian model, and its distribution can be evaluated numerically as a finite-dimensional integral. This paper reviews the use and structure of the Slepian model the regression method and shows how they can be used to obtain good numerical approximations to various crossing variables. It gives a detailed account of the regression method for Gaussian processes with auxiliary variables chosen in a recursive way. (KR)

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DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), \*CROSSINGS, \*MATHEMATICAL MODELS, \*REGRESSION ANALYSIS, DISTRIBUTION, FUNCTIONS, INTEGRALS, QUANTITY, RECURSIVE FUNCTIONS, RESIDUALS, SIZES(DIMENSIONS), STATISTICAL PROCESSES, STOCHASTIC PROCESSES, THEORY, VARIABLES.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A5.

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NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

TEXAS UNIV MEDICAL SCHOOL AT HOUSTON DEPT OF NEUROBIOLOGY AND ANATOMY

(U) On the Existence of Local Times: A Geometric Study.

(U) Analysis and Synthesis of Adaptive Neural Elements and Assemblies.

DESCRIPTIVE NOTE: Technical rept..

DESCRIPTIVE NOTE: Annual rept. 1 Aug 88-31 Jul 89.

JAN 90

DEC 89

PERSONAL AUTHORS: Anderson, J. M.; Horowitz, Joseph; Pitt, L. D.

PERSONAL AUTHORS: Byrne, John H.

REPORT NO. TR-281

CONTRACT NO. AFOSR-87-0274

CONTRACT NO. F49620-85-C-0144, \$NSF-DMS87-01212

PROJECT NO. 2312

PROJECT NO. 2304

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR  
TR-90-0061

MONITOR: AFOSR  
TR-90-0280

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) We present a general study relating the geometry of the graphs of a real function to the existence of local times for the function. The general results obtained are applied to Gaussian processes, and we show that with probability 1 the sample functions of a non-differentiable stationary Gaussian process with local times will be Jarnik functions. This extends earlier works of Lifshitz and Pitt, which gave examples of Gaussian process without local times. An example is given of a Jarnik function without local times thus answering negatively a question raised by Geman and Horowitz. (KR)

DESCRIPTORS: (U) \*TIME STUDIES, \*GEOMETRY, \*STATISTICAL PROCESSES, FUNCTIONS, GRAPHS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

ABSTRACT: (U) The objectives of this research are to analyze the properties of identified neurons and neural circuits that exhibit nonassociative and associative plasticity and to examine the role of neuronal plasticity in learning. During the period between August 1, 1988 and July 31 1989, progress has been made in four areas. First, a model of the biophysical processes within sensory neurons that contribute to nonassociative and associative learning was developed. Second, a model of biophysical patterns of activity in neuron R15 was developed. Third, a real-time model of associative learning was incorporated into small neural networks, which include facilitatory and inhibitory interneurons, and the ability of these networks to stimulate higher-order features of classical conditioning was examined. Fourth, a model which stimulates aspects of classical conditioning was incorporated into a small neural network, and the ability of this neural network to simulate features of operant conditioning was examined. Keywords: Aplysia; Learning; Memory; Information storage; Artificial intelligence. (KT)

DESCRIPTORS: (U) \*APLYSIA, \*ARTIFICIAL INTELLIGENCE, \*ASSOCIATIVE PROCESSING, \*DATA STORAGE SYSTEMS, \*LEARNING, ADAPTIVE SYSTEMS, BIOPHYSICS, CIRCADIAN RHYTHMS, CYTOLOGY, Memory; Information storage; Artificial intelligence. (KT)

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MODELS, NERVE CELLS, NERVOUS SYSTEM, NEURAL NETS,  
. PATTERNS, PLASTIC PROPERTIES, REAL TIME, RUPTURE,  
SENSES(PHYSIOLOGY), SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, Adaptive  
neural networks.

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JOHNS HOPKINS UNIV BALTIMORE MD

(U) Ultrastructure Processing of Ordered Polymers.

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-31 May 89,

JAN 90

PERSONAL AUTHORS: Eby, R. K.

CONTRACT NO. AFOSR-87-0320

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-90-0240

UNCLASSIFIED REPORT

ABSTRACT: (U) In order to explore the nonlinear elasticity of high-performance PBZT fibers, a method using laser-generated ultrasound has been developed to measure the Young's modulus of the fibers as a function of temperature and static tensile stress. X-ray diffraction has also been used to measure both the crystal modulus and aspects of the ultra-structure such as crystal size, unit cell structure and orientation. It is shown that improved crystal orientation with increased tensile stress is one of the most important mechanisms of the nonlinear elasticity. Nonlinear elasticity, Temperature, PBZT, Strong fibers, Modulus, Laser-generated ultrasound, X-ray, Relaxation, Orientation, Stress, Crystal modulus, Unit cell, Uniform stress, Uniform strain, Processing, Crystal size. (jg)

DESCRIPTORS: (U) \*POLYMERS, CELL STRUCTURE, CELLS, CRYSTALS, ELASTIC PROPERTIES, LASERS, NONLINEAR SYSTEMS, ORIENTATION(DIRECTION), PERFORMANCE(ENGINEERING), SIZES(DIMENSIONS), STATICS, STRESSES, TENSILE STRESS, ULTRASONICS, X RAY DIFFRACTION.

IDENTIFIERS: (U) WUAFOSR2303A, PE61102F.

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BOEING AEROSPACE CO SEATTLE WA

Keywords: Current density. (aw)

(U) Processing, Fabrication, Characterization and Device  
Demonstration of High Temperature Superconducting  
Ceramics.

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*SUPERCONDUCTORS,  
CITRATES, CURRENT DENSITY, ELECTRICAL CONDUCTIVITY,  
CERAMIC FIBERS, FINE GRAINED MATERIALS, GRAIN BOUNDARIES,  
GRAIN SIZE, HIGH POWER, HIGH TEMPERATURE, LINKAGES, LOW  
STRENGTH, ORGANOMETALLIC COMPOUNDS, POROSITY, SEEDING,  
SILVER, THINNESS, YTTRIUM OXIDES, ELECTRICAL EQUIPMENT,  
MONOLITHIC STRUCTURES(ELECTRONICS).

DESCRIPTIVE NOTE: Final rept. 30 Sep 88-29 Sep 89, annual  
technical rept. 1 Oct 88-30 Nov 89.

JAN 90

IDENTIFIERS: (U) Peritectic reactions.

PERSONAL AUTHORS: Luhman, Thomas S.

CONTRACT NO. F49620-88-C-0143

PROJECT NO. 8499

TASK NO. 01

MONITOR: AFOSR  
TR-90-0236

#### UNCLASSIFIED REPORT

ABSTRACT: (U) Success with organometallics, citrates, and sintered powder compacts has resulted in two approaches for further development of strain tolerant conductors. They are, thin fibers and tapes, and bulk monoliths. A thorough understanding of the phase relationships in high temperature superconductors, including those phase relationships exhibited by the oxygen sublattice has been developed. This has allowed approaches for addressing the weak-link problem. Processes are being developed to reduce the grain size of fibers, tapes and monoliths. This approach offers the potential to deliver strong, fine-grained material and, with the correct alteration of grain boundaries, the elimination of poor electrical conduction across the weak-links. Other facets of this approach include attempts to texture the fine grains, produce adequate porosity to ensure good oxygenation, and the possible incorporation of silver for matrix strengthening. Work was pursued for producing candidate material for devices based on controlling high temperature peritectic reactions, for example seeding of fibers and tapes with yttrium oxide. The goal of this program is to develop material processes for new high temperature superconducting ceramics and to demonstrate these processes in a high current device.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 128 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK

(U) Computer Modeling of Soot Formation Comparing Free Radical and Ionic Mechanisms.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 88-30 Nov 89,

DEC 89

PERSONAL AUTHORS: Frenklach, M.

CONTRACT NO. AFOSR-88-0072

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0059

UNCLASSIFIED REPORT

ABSTRACT: (U) This is a second annual report on collaborative study between AeroChem and Penn State, aimed at development of quantitative physicochemical model of soot formation. The Penn State accomplishments during the last twelve-months period were: The AeroChem ion reaction mechanism was run with a flame code, and the computational results were found to be essentially the same as those reported last year--the PAH formation via the ionic mechanism is slower than via the neutral species pathway; A computer code for modeling large species and soot particle formation and growth was developed; Our neutral reaction mechanism was updated and tested; and A detailed computer simulation of soot particle nucleation and growth in laminar premixed flames was successfully performed using our updated neutral reaction mechanism--for the first time soot particle inception could be modeled from first principles; starting with fuel decomposition and going all the way to predicting, in quantitative agreement with experiment, soot particle properties. (aw)

DESCRIPTORS: (U) \*FLAMES, \*MATHEMATICAL MODELS, \*PHYSICOCHEMICAL PROPERTIES, \*SOOT, CODING, COMPUTATIONS, COMPUTER PROGRAMS, COMPUTERIZED SIMULATION, DECOMPOSITION, FREE RADICALS, FUELS, IONS, LAMINAR FLOW, MIXING, NEUTRAL, NUCLEATION, PARTICLES, RESPONSE, COMBUSTION.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 068 13/3 20/11

AD-A218 068 CONTINUED

NORTHWESTERN UNIV EVANSTON IL DEPT OF CIVIL ENGINEERING

DESCRIPTORS: (U) \*CRACK PROPAGATION, BRIDGES, CONCRETE, CRACKS, DEFLECTION, DISPLACEMENT, ENERGY, FRACTURE/MECHANICS, HOLOGRAPHY, INPUT, INTERFEROMETRY, LASERS, LIGAMENTS, MICROCRACKING, MICROSCOPY, MULTIMODE, OPENING(PROCESS), PRESSURE, PROFILES, RESISTANCE, STABILITY, TOUGHNESS.

(U) A Study of Fracture Processes in Concrete Using Laser Holography.

DESCRIPTIVE NOTE: Final rept. Aug 88-Sep 89.

DEC 89

IDENTIFIERS: (U) PE61102F, WUAF0SR2302C2.

PERSONAL AUTHORS: Shah, Surendra P.

CONTRACT NO. F49820-88-C-0118

PROJECT NO. 2302

TASK NO. C2

MONITOR: AFOSR  
TR-90-0085

UNCLASSIFIED REPORT

ABSTRACT: (U) Conventional linear elastic fracture mechanics cannot explain fracture in concrete and mortar. Unlike traditional LEFM materials which show a constant fracture toughness, concrete and mortar toughen (show more resistance to fracture) as cracks propagate until an instability results and the structure fails. This increase in toughness is thought to occur because of many possible complex mechanisms which take place during fracture in concrete and mortar. These mechanisms include: formation of a zone of microcracking around the crack tip; crack bridging, where aggregate particles span the crack and act as ligaments to hold the crack together; and crack deflection, where the crack changes direction. All of these mechanisms require additional energy input into the system and may explain the apparent toughening of the material. It is generally assumed that the closing pressure is a function of the crack opening displacement  $w$ ). In this study, crack profiles as well as the full field microscopic displacements on the fracture process zone were accurately measured by laser holographic interferometry. The first two parts of this report discuss mode I fracture of concrete which was studied using center notched plate specimens. In the last part of this report, a study of mixed mode crack propagation under compression is described. (RH)

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AD-A218 067 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Collisional Relaxation of H<sub>2</sub>CO (A(1) A sub 2, V4 = 1,  
J sub ka = (13) sub 2, 12) by He, Ar, Xe, and N<sub>2</sub>,

JUL 89

PERSONAL AUTHORS: Field, Robert W.; Stibey, Robert J.

CONTRACT NO. AFOSR-88-0062

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-90-0009

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub in Jnl. of Chemical Physics, v91  
n2 p1008-1011, 15 Jul 89.

ABSTRACT: (U) The mechanisms underlying the collision-induced and collision-free decay of molecules in excited electronic states have long been of fundamental interest in chemical physics. Over the past years the formaldehyde molecule has become a model system for understanding the photophysical and photochemical properties of small molecules. H<sub>2</sub>CO has been among the first species for which detailed studies have been performed at the level of fully resolved rovibronic eigenstates. Extensive studies of relaxation processes in H<sub>2</sub>CO in the A 1A(2) first excited singlet electronic state have recently been reported from this laboratory. These experiments, which utilized the techniques of transient gain spectroscopy (TGS) and polarization-detected transient gain spectroscopy (PTGS), have yielded rate constants for both the collision-free decay of H<sub>2</sub>CO in numerous selected excited rovibronic levels and the collision-induced relaxation with M = H<sub>2</sub>CO (X 1A(2)) as the collider. The present publication is concerned with a complementary study of collisional relaxation of H<sub>2</sub>CO (A) with the noble gases He, Ar, and Xe, and with N<sub>2</sub>. Measurements are described of the rate constants for collisional depopulation of one specific rovibronic level of H<sub>2</sub>CO (A). Reprints. (aw)

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DESCRIPTORS: (U) \*ELECTRONIC STATES, \*FORMALDEHYDE, \*PHOTOCHEMICAL REACTIONS, \*RELAXATION, \*MOLECULE MOLECULE INTERACTIONS, CHEMICALS, COLLISIONS, CONSTANTS, GAIN, MODELS, MOLECULES, PHYSICAL PROPERTIES, PHYSICS, POPULATION(MATHEMATICS), RARE GASES, RATES, REPRINTS, SPECTROSCOPY, TRANSIENTS, MOLECULAR ROTATION, MOLECULAR VIBRATION, EXCITATION, REACTION KINETICS, HELIUM, ARGON, XENON, NITROGEN, MOLECULAR ENERGY LEVELS, DECAY.

IDENTIFIERS: (U) PEG1102F, WUAFQSR2303B1, \*Molecular relaxation, Rovibronic eigenstates, Singlet states, TGS(Transient Gain Spectroscopy), PTGS(Polarization Detected Transient Gain Spectroscopy).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A218 065 7/4 20/5

AD-A218 065 CONTINUED

FLORIDA AGRICULTURAL AND MECHANICAL UNIV TALLAHASSEE  
DEPT OF PHYSICS

(U) The Loewdin Alpha Function and Its Application to the  
Multi-Center Molecular Integral Problem Over Slater-  
Type Orbitals,

89

EXTERNAL, INFINITE SERIES, INTERNAL, MOLECULES, NUMBERS,  
POLYNOMIALS, RANGE(DISTANCE), REGIONS, REPRINTS,  
SPHERICAL HARMONICS, TEST AND EVALUATION,  
MATRICES(MATHEMATICS), NUMERICAL METHODS AND PROCEDURES.  
IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Loewdin alpha  
function, Multicenter molecular integrals, Slater type  
orbitals, STOS(Slater Type Orbitals).

PERSONAL AUTHORS: Jones, Herbert W.; Weatherford, Charles  
A.

CONTRACT NO. F49620-89-C-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0129

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Structure  
(Theochem) v199 p233-243 1989.

ABSTRACT: (U) In this paper we trace the evolution of  
the Lowdin alpha-function method in its application to  
multi-center molecular integrals over Slater-type  
orbitals (STOs). As is well-known, any STO displaced from  
the origin can be expanded in an infinite series of  
spherical harmonics; the functional coefficients have  
been designated as Lowdin alpha functions. These alpha  
functions can be represented as exponentials multiplied  
by polynomials in the displacement distance and the  
radial distance. The polynomials are used to construct a  
C matrix with integer elements. To avoid cancellation  
errors in some cases, the exponentials are expanded to  
obtain E matrices for interior regions and F matrices for  
exterior regions. We believe that this careful approach  
to molecular integrals will succeed in producing accurate  
and rapid evaluation of the integrals needed in STO basis-  
set methods for quantum chemistry. Keywords: Molecular  
orbitals, Reprints. (aw)

DESCRIPTORS: (U) \*EXPONENTIAL FUNCTIONS, \*INTEGRALS,  
\*MOLECULAR ORBITALS, \*QUANTUM CHEMISTRY, ACCURACY,  
CANCELLATION, COEFFICIENTS, DISPLACEMENT, ERRORS,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A218 015 CONTINUED

LASER APPLICATIONS RESEARCH CENTER THE WOODLANDS TX

(U) Short Wavelength Laser/Materials Interactions.

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 85-30 Sep 88.

DEC 89

PERSONAL AUTHORS: Fredin, Leif G.; Halligan, David T.; Krenek, Brendan D.; Kunz, Terry D.; Menefee, Richard F.

CONTRACT NO. AFOSR-85-0365

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-90-0049

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall objective of the program is to understand the nature of laser interactions with materials, with special emphasis on the phenomenology and effects associated with short wavelength laser interactions with spacecraft materials. HARC/Rice personnel have completed the following projects: 1) development of new diagnostic instrumentation and testing methods for evaluation of laser effects and high temperature performance, 2) fundamental studies of laser/materials interactions, 3) determination of short wavelength laser/materials interaction phenomena and effects, and 4) materials evaluation. The program has led to major advances in science-based understanding of materials performance under extreme conditions for two applications: 1) enhancement of spacecraft survivability, and 2) development of high and ultrahigh temperature oxidation-resistant materials. Keywords: Laser effects; Laser/materials interactions; Optical properties; Pyrometry; Plume spectroscopy; Laser hardened materials; Spacecraft survivability; Ultrahigh temperature; Oxidation resistant materials; Ablation. (JHD)

DESCRIPTORS: (U) \*RADIATION HARDENING, \*LASER TARGET INTERACTIONS, ABLATION, DIAGNOSTIC EQUIPMENT, HIGH TEMPERATURE, INTERACTIONS, LASER BEAMS, OPTICAL

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PROPERTIES, OPTIMIZATION, OXIDATION RESISTANCE, PLUMES, PYROMETERS, RADIATION EFFECTS, SHORT WAVELENGTHS, SPACECRAFT COMPONENTS, SPECTROSCOPY, SURVIVABILITY, HIGH TEMPERATURE, TEST AND EVALUATION.

IDENTIFIERS: (U) PE6110ZF, WUAFOSR2306A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 988 20/3

AD-A217 940 20/3 11/3 20/12 20/8

NORTHWESTERN UNIV EVANSTON IL

ROCKWELL INTERNATIONAL THOUSAND OAKS CA SCIENCE CENTER

(U) High Field Superconductivity of Chervel Phase Compounds.

(U) Dielectric Composite Thin Films.

DESCRIPTIVE NOTE: Interim rept.,

DESCRIPTIVE NOTE: Final rept. 15 Jan 88-14 Sep 89,

APR 81

NOV 89

PERSONAL AUTHORS: Freeman, J.

PERSONAL AUTHORS: Sankur, H. O.

CONTRACT NO. AFOSR-81-0024

REPORT NO. SC5537.FR

MONITOR: AFOSR  
TR-90-0024

CONTRACT NO. F49620-88-C-0034

PROJECT NO. 2308

UNCLASSIFIED REPORT

TASK NO. B1

MONITOR: AFOSR  
TR-90-0072

UNCLASSIFIED REPORT

ABSTRACT: (U) A brief description is given on the electronic structure of complex systems and the origin of their electronically driven phase transitions. The properties of the Chervel phase compounds, particularly  $\text{SrMoS}_8$  and  $\text{EuMoS}_8$ , are of great scientific and technological interest because of their unusual high magnetic field properties including the enhancement of the upper critical field  $H_{c2}$  observed when Eu is added to  $\text{SrMoS}_8$ . For example, up to an Eu concentration of 0.5,  $t$  sub c is hardly changed with the depression occurring abruptly only at high concentration. This behavior is contrary to observations on all other materials with the addition of a local magnetic moment and the theory of Abrikosov and Gor'kov. (Jnd)

DESCRIPTORS: (U) \*SUPERCONDUCTORS, \*CHALCOGENS, CONCENTRATION(COMPOSITION), ELECTRONIC STATES, HIGH RATE, MAGNETIC FIELDS, MAGNETIC MOMENTS, MAGNETIC PROPERTIES, PHASE TRANSFORMATIONS, SUPERCONDUCTIVITY.

IDENTIFIERS: (U) Chervel Phase.

ABSTRACT: (U) Mixed composition films are widely used in gradient index and in discrete optical coatings. This study addressed the composition dependent properties of these films with special emphasis on the effect of composition on the film microstructure and structure-property relationships. One visible, Titanium dioxide-Silicon dioxide, and two potential infrared,  $\text{ZnSe-SrF}_2$  and  $\text{Si-YF}_3$ , material systems were studied. The effect of composition, deposition and post-deposition treatment conditions on film properties such as intrinsic stress, moisture penetration, refractive index, optical scatter, morphology and crystallization have been investigated. The macroscopic film properties were observed to strongly depend on composition. This is not only due to 'averaging' of the properties of the pure constituents in the mixture but also because of unique film microstructures engendered by the composite chemical environment during film growth. In general many of the microstructure dependent properties (e.g., stress) vary nonlinearly with composition and cannot be predicted on the basis of the properties of the pure constituents. In this study the process conditions and compositions that produce films with low stress, smooth morphology, dense microstructure and low or no water content have been established in three material systems studied. (aw)

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 940 CONTINUED

AD-A217 922 4/1

COLORADO UNIV AT BOULDER

DESCRIPTORS: (U) \*DIELECTRIC FILMS, \*MICROSTRUCTURE, \*OPTICAL COATINGS, \*THIN FILMS, CHEMISTRY, COMPOSITE MATERIALS, CRYSTALLIZATION, DEPOSITION, GRADIENTS, GROWTH(GENERAL), HIGH DENSITY, INDEXES, INFRARED RADIATION, LIGHT SCATTERING, MOISTURE, MOISTURE CONTENT, MOLECULAR STRUCTURE, MORPHOLOGY, PENETRATION, PHYSICAL PROPERTIES, PURITY, REFRACTIVE INDEX, STRESSES, VISIBILITY, TITANIUM DIOXIDE, SILICON DIOXIDE, ZINC SELENIDES, STRONTIUM COMPOUNDS, FLUORIDES, SILICON, YTTERBIUM COMPOUNDS.

(U) A Comparison of Two Neutral Wind Models Affecting Ionospheric F2 Region Peak Electron Densities Near the Magnetic Equator.

82

PERSONAL AUTHORS: Anderson, David N.

CONTRACT NO. AFOSR-83-0817

MONITOR: AFOSR  
TR-90-0097

IDENTIFIERS: (U) PE81102F, WJAFOSR2308B1, Gradient indexes.

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*IONOSPHERIC MODELS, ELECTRON DENSITY, F REGION, PEAK VALUES, NEUTRAL, THERMOSPHERE, WIND, DRIFT, MAGNETIC FIELDS, EQUATORIAL REGIONS, COMPARISON.

IDENTIFIERS: (U) Neutral wind models, Magnetic equator.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 882 CONTINUED

COMPUTATIONAL MECHANICS CO INC AUSTIN TX

(U, Analysis of Flow-, Thermal-, and Structural-  
Interaction of Hypersonic Structures Subjected to  
Severe Aerodynamic Heating.

DESCRIPTIVE NOTE: Annual rept. no. 2 (Final), 1 Nov 88-1  
Nov 89.

NOV 89

REPORT NO. TR-89-15

CONTRACT NO. F49620-88-QK-0001

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-90-0050

UNCLASSIFIED REPORT

ABSTRACT: (U) Over the past two years a unique collection of algorithms have been developed for the analysis of hypersonic structures subjected to severe aerodynamic heating. These algorithms employ adaptive computational methods to resolve many of the complex structural and flow features such as nonelastic, large, time-dependent structural deformations, shock interaction boundary layers and shock interactions. Local error estimates were used to evaluate the quality of the computed solutions and subsequently optimize the structure of the grids to deliver a specified level of accuracy with a minimum of computational effort. In addition, implicit/explicit solution algorithms for the fluid modeling were employed which exploit the speed and simplicity of explicit methods and the stability of implicit methods. Zoning techniques for automatically selecting the implicit and explicit zones were studied with optimization of the computational effort as the central goal. The modeling of the structural problems incorporated a version of the Bodner-Partom constitutive model for time-dependent viscoplastic materials. During the course of this study this model was extended to include a damage parameter which was treated as an additional internal state variable. A number of

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validation cases were run to test the various components of the package and prepare for the experimental verification which was planned for year three. Keywords: Hypersonic flight, Viscous compressible flow. (kr)

DESCRIPTORS: (U) \*AERODYNAMIC HEATING, \*RESEARCH AIRCRAFT, \*STRUCTURAL RESPONSE, ACCURACY, ADAPTATION, ALGORITHMS, BOUNDARY LAYER, COLLECTION, COMPRESSIBLE FLOW, DAMAGE, DEFORMATION, ERROR ANALYSIS, ESTIMATES, FLUIDS, GRIDS, HIGH RATE, HYPersonic CHARACTERISTICS, HYPersonic FLIGHT, INTENSITY, INTERACTIONS, INTERNAL, MODELS, NUMERICAL METHODS AND PROCEDURES, OPTIMIZATION, PARAMETERS, SHOCK, SOLUTIONS(GENERAL), STRUCTURAL PROPERTIES, STRUCTURES, TIME DEPENDENCE, VALIDATION, VISCOUS FLOW.

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B1.

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SEARCH CONTROL NO. EVJ20M

AD-A217 881 11/2 5/1

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NATIONAL ACADEMY OF SCIENCES WASHINGTON DC

INDIANA UNIV AT BLOOMINGTON DEPT OF COMPUTER SCIENCE

(U) High Technology Ceramics in Japan.

(U) Probabilistic Analysis of Algorithms for NP-Complete Problems.

DESCRIPTIVE NOTE: Final rept. 15 Mar 83-14 Jul 84,

DESCRIPTIVE NOTE: Final rept. 30 Sep 84-29 Sep 89,

JUL 84

SEP 89

PERSONAL /UTHORS: Zwilsky,

PERSONAL AUTHORS: Franco, John

CONTRACT NO. AFOSR-ISSA-83-00049

CONTRACT NO. AFOSR-84-0372

MONITOR: AFOSR

TR-90-0145

PROJECT NO. 2304

UNCLASSIFIED REPORT

TASK NO. A2

MONITOR: AFOSR

TR-90-0119

UNCLASSIFIED REPORT

**ABSTRACT:** (U) High-technology ceramics are made from extremely pure, composition-controlled, ultra-minute particles formed, sintered, and treated under closely regulated conditions. These properties and processes give superior performance characteristics that allow the materials to be used in a wide range of demanding applications far beyond the capabilities of conventional ceramics. Japan is widely viewed as having a significant national commitment to developing and exploiting high-technology ceramics in order to advance its domestic and international markets. This situation contrasts markedly with that in the United States, where such an intensive effort has not been mounted. This report presents the findings of a committee formed to assess the situation in Japan, with the objective of providing an understanding of the possible effects on high-technology ceramics in the United States. Another important objective was to establish a basis for possible future cooperation in ceramics science and technology between Japan and the United States. The committee concluded that there is, indeed, a strong commitment in Japan to the rapid development and exploitation of high-technology ceramics. The greatest potential for application of this technology appears to be in the automobile and electronics industries. Cooperation between Japan and the United States would be feasible and welcome, especially in the development of common standards. (kr)

**DESCRIPTORS:** (U) \*CERAMIC MATERIALS, \*JAPAN, DOMESTIC, ELECTRONICS, INDUSTRIES, INTERNATIONAL, MARKETING, RANGE(EXTREMES), STANDARDS, UNITED STATES.

AD-A217 881

**ABSTRACT:** (U) This is the final scientific report describing results obtained under Air Force Office of Scientific Research grant number AFOSR-84-0372. The main objective was the probabilistic sense, it is easy to find a satisfying truth assignment to an instance of satisfiability but it is hard to verify that an unsatisfiable instance has a solution. A side issue was the analysis of probabilistic models used to obtain the main results. (KR)

**DESCRIPTORS:** (U) \*ALGORITHMS, \*STATISTICAL ANALYSIS, MATHEMATICAL MODELS, PROBABILITY.

**IDENTIFIERS:** (U) PEG1102F, WUAFOSR2304A2.

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AD-A217 879 20/12

AD-A217 878 20/6 20/11

ILLINOIS UNIV AT URBANA DEPT OF PHYSICS

HOUSTON UNIV TX

(U) Development of Qualitative Theories of the Fundamental Electronic Structure of Pure and Impure Semiconductors.

(U) Stress Field Near Crack Tip: An Experimental Evaluation of the Three Dimensional Variation.

DESCRIPTIVE NOTE: Rept. for 31 Mar-Jun 81,

DESCRIPTIVE NOTE: Final rept. 1 May 87-31 Aug 89,

JUN 81

NOV 89

PERSONAL AUTHORS: Kunz, A. B.

PERSONAL AUTHORS: Ravi-Chandar, K.

CONTRACT NO. AFOSR-78-2989

CONTRACT NO. AFOSR-87-0183

MONITOR: AFOSR  
TR-90-0048

PROJECT NO. 2302

TASK NO. B2

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-90-0088

ABSTRACT: (U) The past five years of this project have been devoted to (development of qualitative theories of the fundamental electronic structure of pure and impure semiconductors.) The basic theoretical tools and also conclusions relating to chiefly photoemission type experiments and to some extent spectroscopy of pure II-VI and III-V compounds are presented. Basic complete work relating to adsorbates and their spectra are reported. This investigation has the purpose of performing self-consistent energy band calculations on some of the II-VI compounds, such as cadmium sulfide, zinc oxide, and zinc sulfide. These materials have applications as phosphors (ZnS and CdS), as infrared detectors (ZnS), in photo voltaic cells (CdS-Cu<sub>2</sub>S or CdS-CdTe heterojunctions), in batteries (ZnO), as FETs (CdS), in heterojunction lasers (CdS), and even as acoustic amplifiers (CdS). (jhd)

DESCRIPTORS: (U) \*CADMIUM TELLURIDES, \*CADMIUM SULFIDES, \*ELECTRONIC STATES, \*SEMICONDUCTORS, \*ZINC OXIDES, \*ZINC SULFIDES, AUDIO AMPLIFIERS, CELLS, COMPUTATIONS, CONSISTENCY, ENERGY BANDS, GROUP III COMPOUNDS, GROUP II-VI COMPOUNDS, GROUP V COMPOUNDS, HETEROJUNCTIONS, IMPURITIES, INFRARED DETECTORS, SEMICONDUCTOR LASERS, PHOSPHORS, PHOTOELECTRIC EMISSION, PHOTOVOLTAIC EFFECT, PURITY, QUALITATIVE ANALYSIS, SPECTROSCOPY, THEORY.

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UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes the results on the project obtained during the two year period. A new special purpose laboratory equipment called the Scattered Light Polariscopes has been designed and constructed. The Polariscopes system consists of a device for loading the specimen, optical alignment devices for precise positioning of the specimen with respect to the incident light and an imaging system with a video camera, digitizing frame grabber and image processing software. The systems have all been assembled and tested for proper operation. Certain limitations of the current photoelastic equations were performed. Calibration experiments have been performed to determine the reliability of the technique as well as the data interpretation procedures. Results have been obtained on the nature of the stress variation near the tip of a rounded notch and a crack. Significant differences have been demonstrated between the two and three dimensional stress fields. Keywords: Fracture, Scattered light photoelasticity, Three dimensional problems.

DESCRIPTORS: (U) \*POLARISCOPES, \*STRESS ANALYSIS, \*CRACKS, ALIGNMENT, CALIBRATION, CAMERAS, COMPUTER PROGRAMS, DATA PROCESSING, EQUATIONS, IMAGE PROCESSING, IMAGES, LIGHT SCATTERING, OPTICAL EQUIPMENT, PHOTOELASTICITY, POSITION(LOCATION), PRECISION,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A217 877 22/1 19/5

RELIABILITY, STRESSES, TEST AND EVALUATION, THREE  
DIMENSIONAL, VARIATIONS, VIDEO SIGNALS.

MICHIGAN UNIV ANN ARBOR DEPT OF ELECTRICAL ENGINEERING  
AND COMPUTER SCIENCE

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B2, \*Stress Fields,  
\*Crack Tip.

(U) Aiming Control: Theory and Applications to Dynamic  
Control of Space Structures.

DESCRIPTIVE NOTE: Annual rept. 1 Aug 88-31 Jul 89,

JUL 89

PERSONAL AUTHORS: Meerkov, Semyon M.

CONTRACT NO. F49620-87-C-0079

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-90-0035

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes the results obtained during the second year of the project. The goal of the project as a whole is the investigation of fundamental bounds on the maximal achievable precision of aiming of dynamical systems with random perturbations and application of these bounds to control of space structures. To this end, during the second year of the project the following results have been obtained: it has been shown that linear systems with small additive noise can be pointed with any desired accuracy by output feedback if and only if the system is invertible and minimum phase in an approximate sense; when the measurements noise is present, the maximal achievable precision of aiming is bounded, even if the conditions mentioned above are satisfied; thus, the measurement noise has a more severe effect on the pointability of dynamical system than the input noise. In addition, the problem of residence probability control has been investigated and its relation to the problem of residence time control has been analyzed. Keywords: Aiming control; Large deviations theory; Residence time; Pointing processes. (jhd)

DESCRIPTORS: (U) \*AIMING, \*MILITARY SATELLITES, ACCURACY,  
CONTROL, DYNAMICS, FEEDBACK, HIGH RATE, INPUT, INTENSITY,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 877 CONTINUED

LINEAR SYSTEMS, MEASUREMENT, NOISE, OUTPUT, PERTURBATIONS,  
PRECISION, PROBABILITY, THEORY, TIME.

AD-A217 863 7/2 7/3 7/4

GEORGIA INST OF TECH ATLANTA DEPT OF CHEMISTRY

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

(U) International Conference on Organometallic Chemistry  
(11th) Held in Pine Mountain, Georgia on 13 October  
1983 (Pure and Applied Chemistry). Volume 56. Number 1.

DESCRIPTIVE NOTE: Final rept. 1 Jun 83-31 May 84.

JAN 84

PERSONAL AUTHORS: Ashby, F. C.

CONTRACT NO. AFOSR-83-0160

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0045

UNCLASSIFIED REPORT

ABSTRACT: (U) Partial contents: Some aspects of the  
chemistry of alloy and hydride derivatives of  
permethylscandorene; Mechanistic and synthetic aspects of  
organometallic oxidative additions; 11th International  
conference on organometallic chemistry. (kr)

DESCRIPTORS: (U) \*CHEMISTRY, \*ORGANOMETALLIC COMPOUNDS,  
ADDITION, ALLOYS, INTERNATIONAL, MOUNTAINS, OXIDATION,  
PURITY, SYMPOSIA.

IDENTIFIERS: (U) WUAFOSR2303B1, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A217 859 CONTINUED

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Variational Phase-Space Theory Studies of Silicon-Atom Diffusion on Reconstructed Si(111)-(7x7) Surfaces.

NOV 89

PERSONAL AUTHORS: Agrawal, Paras M.; Thompson, Donald L.,  
Raff, Lionel M.

CONTRACT NO. AFOSR-89-0085

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0131

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. Chemical Physics, v91  
n10 p6463-6471, 15 Nov 89.

ABSTRACT: (U) The dynamics of silicon-atom diffusion on a reconstructed Silicon(111)-(7x7) surface have been investigated using variational phase-space theory methods with a previously described potential-energy surface. A four-layer lattice model of the Binnig et al. (7x7) reconstruction containing 291 atoms is employed for the surface. Canonical Markov walks with importance sampling incorporated are used to evaluate the flux across both right-circular and right-elliptical cylindrical dividing surfaces separating adsorption sites. This flux is minimized with respect to the parameters of the dividing surface to obtain the best estimate of the classical jump frequencies. The minimum jump frequencies so obtained are corrected for recrossings of the dividing surface by the calculation of trajectories that start from phase-space points obtained in the random walk that lie within a specified distance  $w$  of the dividing surface. The corrected jump frequencies are then used as input to a set of 225 differential equations that describe the diffusion rates across the (7x7) surface. The results suggest that diffusion rates are a sensitive function of the geometry of the (7x7) reconstruction so that careful measurements of diffusion rates and associated activation energies may be able to serve as a means of

differentiating different proposed models of the Si(111)-(7x7) reconstruction. Keywords: Diffusion coefficient, Reprints. (aw)

DESCRIPTORS: (U) \*DIFFUSION, \*SILICON, \*ATOMS, \*SURFACE CHEMISTRY, ACTIVATION ENERGY, ADSORPTION, CORRECTIONS, DIFFUSION COEFFICIENT, FREQUENCY, FUNCTIONS, RANDOM WALK, RANGE(DISTANCE), RATES, REPRINTS, SAMPLING, SENSITIVITY, SITES, TRAJECTORIES, CRYSTALS, POTENTIAL ENERGY, CRYSTAL LATTICES, MODELS, MARKOV PROCESSES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, Jump Frequency.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

(U) 5-(Perfluoroalkyl) Tetrazoles: Eta(5) Ligands in Solution and mu-2,3-eta(2) Ligands in Solid Complexes,

89

PERSONAL AUTHORS: John, Earnest O.; Willett, Roger D.; Scott, Brian; Kirchmeier, Robert L.; Shreeve, Jeanne M.

CONTRACT NO. AFOSR-87-0087, NSF-CHE84-04974

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0133

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28 p893-897 1989.

ABSTRACT: (U) Tetrazoles and their salts containing the -NF<sub>2</sub> moiety may be useful as oxidizers when combined chemically with fuels such as anhydrous hydrazine. Highly fluorinated nitrogen compounds that contain the -NF<sub>2</sub>, -NCl<sub>2</sub>, -NCl, and -N=N- functionalities are very reactive synthetic reagents and are potentially explosive materials. In this paper, we report the synthesis of sodium 5-((difluoroamino)difluoromethyl)tetrazolate, sodium 5-((trifluoromethyl)tetrazolate, and their eta 5 complexes, and CF<sub>3</sub>CNNMn(CO)<sub>3</sub> in solution. Sodium azide was reacted with (difluoroamino)difluoroacetonitrile, NF<sub>2</sub>CF<sub>2</sub>CN (1), to give sodium 5-((difluoroamino)difluoromethyl)tetrazolate (2) in a reaction analogous to that with Trifluoroacetonitrile where the previously known sodium 5-((trifluoromethyl)tetrazolate (3) was formed. Reactions of 2 and 3 with pentacarbonylmanganese bromide give the compounds R(f)C<sub>5</sub>N<sub>4</sub>Mn(CO)<sub>3</sub>(R(f) = NF<sub>2</sub>CF<sub>2</sub>CF<sub>3</sub>). Reprints. (aw)

DESCRIPTORS: (U) \*TETRAZOLES, \*SODIUM COMPOUNDS, \*LIGANDS, \*SYNTHESIS(CHEMISTRY), CHEMICAL AGENTS, EXPLOSIVES, FLUORINATION, FUELS, HYDRAZINES, NITROGEN COMPOUNDS, OXIDIZERS, REACTIVITIES, REPRINTS, SODIUM AZIDES, SOLIDS, COMPLEX COMPOUNDS, AMINES, METHYL

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RADICALS, SOLUTIONS(MIXTURES), CARBONYL COMPOUNDS, MANGANESE COMPOUNDS, BROMIDES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Tetrazole/  
Sodium-5-((Difluoroamino)Difluoromethyl), Tetrazole/  
Sodium-5-((Trifluoromethyl), Bromide/  
Pentacarbonylmanganese.

## UNCLASSIFIED

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AD-A217 857 20/4 21/4

AD-A217 857 CONTINUED

## NIELSEN ENGINEERING AND RESEARCH INC MOUNTAIN VIEW CA

Computational fluid dynamics; Reprints. (edc)

(U) Simulation of Fundamental Atomization Mechanisms in Fuel Sprays.

DESCRIPTORS: (U) \*ATOMIZATION, \*FUEL SPRAYS, \*LIQUID JETS, ACCURACY, ALGORITHMS, ANNULAR FLOW, BOUNDARY LAYER, COMPUTATIONS, DENSITY, DROPS, FLUID DYNAMICS, GASES, GROWTH(GENERAL), INCOMPRESSIBLE FLOW, INTERFACES, INTERFACIAL TENSION, JET FLOW, LIQUIDS, LOW VELOCITY, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, PRESSURE, RATES, REPRINTS, SHORT WAVELENGTHS, SIMULATION, SIZES(DIMENSIONS), SOLUTIONS(GENERAL), STABILITY, SURFACE PROPERTIES, SYMMETRY, VARIATIONS.

DEC 89

PERSONAL AUTHORS: Childs, Robert E.; Mansour, Nagi M.

REPORT NO. NEAR-244

CONTRACT NO. F49620-86-C-0062

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0130

IDENTIFIERS: (U) Swirling flow, Computational fluid dynamics, Instability, PE61102F, WUAFOSR2308A2.

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. Propulsion and Power, v5 n6 p841-849, Nov-Dec 89. Prepared in cooperation with Ames Research Center, Moffett Field, CA.

ABSTRACT: (U) Growth of instabilities on the liquid/gas interface in the initial region of fuel sprays is studied by means of numerical simulations. Boundary layers on the liquid jets are shown to affect the growth rate of wind-induced instabilities. In a pressure atomized spray, a low speed boundary layer at the edge of the liquid jet reduces the growth rate of short wave length disturbances. Boundary layer effects may be significantly more important than surface tension effects in determining the initial drop size, in some operating regimes. The simulations yield a good estimate for the drop size reported for a pressure atomized spray. For an annular spray, boundary layer effects increase the growth rate of Squire's 'symmetric' mode, which directly causes jet breakup. This result demonstrates an instability mechanism which may account for the rapid atomization that can occur in pressure-swirl atomizers. The simulations are based on numerical solutions of the variable-density incompressible Navier-Stokes equations, which are obtained with a new algorithm. The accuracy of the simulation method is demonstrated by comparisons of analytical and computational results. Keywords:

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AD-A217 843 20/10

IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Synthesis of (Sulfodifluoromethyl)phosphonic Acid,

(U) Quantum-Theoretical Methods and Studies Relating to Properties of Materials.

89

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-30 Jun 89,

PERSONAL AUTHORS: Burton, Donald J.; Modak, Anil S.; Guneratne, Ranil; Su, Debao; Cen, Wenbiao

DEC 89

CONTRACT NO. AFOSR-87-0067, NSF-CHE87-03790

PERSONAL AUTHORS: Ewig, Carl S.

PROJECT NO. 2303

CONTRACT NO. AFOSR-86-0146

TASK NO. B2

PROJECT NO. 2303

MONITOR: AFOSR  
TR-90-0132

TASK NO. A3

MONITOR: AFOSR  
TR-90-0126

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. American Chemical Society, v3 n5 p1773-1776 1989.

ABSTRACT: (U) The compound (Sulfodifluoromethyl) phosphonic acid, (HO)2P(O)CF2SO3H, has been synthesized for the first time. This mixed phosphonic-sulfonic acid was prepared from (C2H5O)2P(O)CF2SO3Na, which had been synthesized via oxidation of the corresponding sulfinate salt, (C2H5O)2P(O)CF2SO3Na. The sulfinate salt was prepared from (C2H5O)2P(O)CF2X (X = Br, I) and (C2H5O)2P(O)CF2SO22Cd precursors. Keywords: Phosphonic-sulfonic acid, Sulfonates, Sulfonyl halide, acid resin, Sulfonate sodium dithionite, Cadmium sulfonates. Reprints. (aw)

DESCRIPTORS: (U) \*PHOSPHONIC ACIDS, \*SYNTHESIS(CHEMISTRY), \*SULFUR, \*FLUORINE, \*METHYL RADICALS, CADMIUM, OXIDATION, POLYMERS, REPRINTS, SULFINATES, SULFONIC ACIDS, CALCIUM COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Sulfodifluoromethyl Phosphonic Acid.

ABSTRACT: (U) This research concerned the development of new ab initio nonempirical quantum-theoretical methods and computational techniques for studying molecular properties related to those of advanced materials. Extensive computations were performed to demonstrate the quality of the theoretically predicted results. These techniques were employed to study in detail several specific molecular species, focussing on those with unusual and potentially useful energies, structures, spectra, and related properties. Keywords: Ab initio; Quantum theory; Molecular spectra; Properties of materials; Computational chemistry. (jhd)

DESCRIPTORS: (U) \*MOLECULAR SPECTROSCOPY, \*QUANTUM THEORY, CHEMISTRY, COMPUTATIONS, MOLECULAR PROPERTIES, MOLECULES.

IDENTIFIERS: (U) Ab initio calculations, Computational chemistry.

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AD-A217 836 7/4 20/12 20/5

IOANNINA UNIV (GREECE)

FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

(U) NATO (North Atlantic Treaty Organization) Advanced Study Institute Fast Reactions in Energetic Systems.

(U) International Journal of Quantum Chemistry. Quantum Chemistry Symposium Number 23: Proceedings of the International Symposium on Quantum Chemistry, Solid-State Theory, and Molecular Dynamics Held in St. Augustine, Florida on 1-8 April 1989.

DESCRIPTIVE NOTE: Final rept. 6-9 Jul 80.

JUL 80

APR 89 765P

PERSONAL AUTHORS: Capellos, C.

PERSONAL AUTHORS: Calais, Jean L.; Oehr, N. Y.

CONTRACT NO. MIPR-80-00036

CONTRACT NO. N00014-89-I-1242, \$AFOSR-89-0280

PROJECT NO. 2808

MONITOR: AFOSR

TR-90-0286

MONITOR: AFOSR

TR-90-0168

UNCLASSIFIED REPORT

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Availability: John Wiley & Sons, Inc., 605 Third Ave., New York, NY 10158. PC \$99.95. No copies furnished by DTIC/NTIS.

ABSTRACT: (U) Abstracts of papers on the following topics are provided: Fast reactions and energy transfer processes -- Advanced diagnostics (Theory of reaction kinetics, Time resolved absorption and emission spectroscopies electronically excited states, Fast ionic reactions in solution, vibrationally excited states, and fast free radical reactions); Self-sustained fast reactions in energetic systems -- Fast molecular processes in combustion/flame chemistry, Coherent Anti-Stokes Raman scattering, Electronic and vibrational energy exchange in molecules and in condensed phases, Fast reactions in dispersed heterogeneous energetic systems, Gasdynamics of fast reactions, and Detonation kinetics. Keywords: Shock waves; Ionization/excitation. (edc)

DESCRIPTORS: (U) \*DETONATIONS, \*ENERGETIC PROPERTIES, \*FLAMES, \*GAS DYNAMICS, ABSORPTION, ABSTRACTS, CHEMISTRY, COHERENT SCATTERING, COMBUSTION, CONDENSATION, DIAGNOSIS(GENERAL), DISPERSING, ELECTRON ENERGY, ENERGY TRANSFER, EXCITATION, FREE RADICALS, HETEROGENEITY, IONIZATION, KINETICS, LIGHT SCATTERING, MOLECULES, NATO, PHASE, QUICK REACTION, RAMAN SPECTRA, REACTION KINETICS, SELF OPERATION, SHOCK WAVES, SOLUTIONS(MIXTURES), EMISSION SPECTROSCOPY, STOKES RADIATION, THEORY, VIBRATION.

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AD-A217 827 11/4

MOLECULES, QUANTUM THEORY, REACTIVITIES, SCATTERING,  
SUPERCONDUCTIVITY, SYMPOSIA, THEORY.

MASSACHUSETTS INST OF TECH CAMBRIDGE TECHNOLOGY LAB FOR  
ADVANCED COMPOSITES

IDENTIFIERS: (U) Quantum biology, Condensed matter  
physics, Quantum molecular dynamics, Molecular graphics.

(U) Fracture and Longevity of Composite Structures.

DESCRIPTIVE NOTE: Final rept. 15 Jun 85-14 Jun 87.

JUN 88

PERSONAL AUTHORS: Lagace, Paul A.

REPORT NO. TELAC-88-14

CONTRACT NO. AFOSR-85-0206

PROJECT NO. 2302

TASK NO. B2

MONITOR: AFOSR  
TR-90-0082

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of several investigations into the fracture and longevity of composite structures are reported. During this year, the work has concentrated on the phenomena of delamination and final failure. Work is reported on the initiation of delamination under tensile and compressive loading. Work on the growth of delamination and the final failure of the specimen under tensile load is also reported. The primary objective of this ongoing research continues to be to gain understanding of the fundamental mechanisms involved in the failure of filamentary composite materials so that the methodologies for predicting fracture and longevity can be developed and enhanced. In addition, via this research, needed data bases can be identified and partially provided. This latter objective does not imply the establishment of the data base within the scope of this effort. Rather, through both analysis and directed experimentation, the critical parameters can be identified and studied in order to gain an understanding of the fundamental fracture and damage mechanisms of composites so that proper engineering data bases and methodologies can be established. Delamination plays an important role in the failure of composite structures. Interlaminar stresses which arise in gradient fields can

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trigger the failure of the interply resin layer. (KR)

NORTH CAROLINA STATE UNIV AT RALEIGH

DESCRIPTORS: (U) \*COMPOSITE STRUCTURES, \*LONG LIFE, \*FRACTURE(MECHANICS), COMPOSITE MATERIALS, COMPRESSIVE PROPERTIES, DAMAGE, DATA BASES, ENGINEERING, FAILURE, FILAMENTS, GRADIENTS, LAMINATES, LOADS(FORCES), PARAMETERS, STRESSES, TENSILE PROPERTIES.

(U) (DURIP) Two-Processor Alliant FX/4 System.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

JAN 90

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B2.

PERSONAL AUTHORS: Kelly, C. T.

CONTRACT NO. AFOSR-89-0124

PROJECT NO. 3842

TASK NO. A5

MONITOR: AFOSR  
TR-90-0075

UNCLASSIFIED REPORT

ABSTRACT: (U) This proposal requested a two-processor Alliant FX/4 system with disk drives, tape backup, operator's console, and local line printer. This computer offers vector processing capability, a high-speed cache memory, and a shared memory multiprocessing architecture. When the project was funded, Alliant was willing to sell a two-processor FX/40 for the same amount. This system supports research in control and optimization, nonlinear least squared problems, partial differential equations, integral equations, parameter identification problems, and signal processing that is currently being carried out at North Carolina State University under AFOSR sponsorship by C.T. Kelley, R.J. Plemmons, M Shearer, and S.J. Wright. The equipment is being used for design and testing of algorithms that take advantage of multiprocessing and vector architectures for large scale problems in these areas, for training of graduate students, and as a high-speed computing resource for problems, such as partial differential equations and large scale optimization problems that are too large to fit on the other local facilities presently available. Keywords: Compilation of research signal processing; Computer systems analysis; Integral/ partial/ least squares problems; Control bad optimization. (EMK)

DESCRIPTORS: (U) \*MULTIPROCESSORS, ALGORITHMS, ARCHITECTURE, COMPUTER APPLICATIONS, COMPUTERS, DISKS.

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DRIVES, FACILITIES, HIGH RATE, IDENTIFICATION, INTEGRAL EQUATIONS, MEMORY DEVICES, NORTH CAROLINA, OPTIMIZATION, PARAMETERS, PARTIAL DIFFERENTIAL EQUATIONS, PRINTERS(DATA PROCESSING), PROBLEM SOLVING, PROCESSING, RESOURCES, SIGNAL PROCESSING, STUDENTS, TIME SHARING, TRAINING, VECTOR ANALYSIS.

PRINCETON UNIV NJ

(U) Bioreactivity: Studies on a Simple Brain Stem Reflex in Behaving Animals.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jun 88-31 May 89.

IDENTIFIERS: (U) WUAFOSR3842A5, PE61104D.

JAN 90

PERSONAL AUTHORS: Jacobs, Barry L.

CONTRACT NO. AFOSR-87-0301

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-90-0060

UNCLASSIFIED REPORT

ABSTRACT: (U) A major problem in attempting to understand complex physiological processes, such as brain neuromodulation, or complex behavioral processes, such as arousal, is finding a simple system that will permit such analyses. The brain stem masseteric (jaw closure) reflex in cats is such a system. It is simple, containing only one synapse in brain, and receives dense inputs from two neurochemical systems important in neuromodulation and arousal. Initial pharmacologic studies showed that locally applied norepinephrine facilitated the reflex response. More importantly, physiologic conditions, known to activate the brain norepinephrine system, also facilitated the response. This latter finding was shown to be causal, rather than correlative, by a study which found that the facilitation could be blocked by prior destruction of the norepinephrine input specifically to the reflex circuitry. These data represent the first definitive example of an activational effect in an intact and behaving organisms being attributable to a particular central neurotransmitter acting at a specific brain site. (sdw)

DESCRIPTORS: (U) \*BEHAVIOR, \*NOREPINEPHRINE, \*VASOMOTOR REFLEXES, ANIMALS, BRAIN, CATS, CIRCUITS, CLOSURES, INPUT, MOUTH, NERVE TRANSMISSION, NEUROCHEMISTRY, PHARMACOLOGY.

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AD-A217 808 12/9 5/8

PHYSIOLOGY, REFLEXES, RESPONSE, SITES, SYNAPSE.

MARYLAND UNIV BALTIMORE

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A2.

(U) A Locally Constrained Parallel Activation Model for Diagnostic Reasoning.

DESCRIPTIVE NOTE: Final rept. 17 Aug 87-16 Aug 89.

OCT 89

PERSONAL AUTHORS: Ahuja, Sanjeev B.

CONTRACT NO. AFOSR-87-0335

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-90-0076

UNCLASSIFIED REPORT

ABSTRACT: (U) A general purpose competition-based parallel activation paradigm for diagnostic reasoning has been formulated. To facilitate the task of formulating and testing this paradigm, a parallel activation model generator had also to be developed. Using the network specification language provided by this generator, a knowledge base for diagnosing faults in a prototype chemical processing plant was built to test the viability of the proposed approach as a practical diagnostic paradigm. Diagnosis of failures in process plants has been attempted in the past using conventional AI methodologies, which have raised several practical issues which need to be resolved before a viable automated tool can be built. (kr)

DESCRIPTORS: (U) \*COMPUTER AIDED DIAGNOSIS, \*ARTIFICIAL INTELLIGENCE, \*PRODUCTION ENGINEERING, ACTIVATION, AUTOMATION, CHEMICAL INDUSTRY, GENERATORS, INDUSTRIAL PLANTS, MODELS, NETWORKS, PARALLEL ORIENTATION, PROCESSING, PROTOTYPES, REASONING, SPECIFICATIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A7.

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## MATERIALS RESEARCH SOCIETY PITTSBURGH PA

## NEW YORK ACADEMY OF SCIENCES NY

(U) Laser- and Particle-Beam Chemical Processes on Surfaces. Volume 129.

(U) Vestibular and Oculomotor Physiology: International Meeting of the Barany Society. Volume 374. Annals of the New York Academy of Sciences,

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-14 May 90.

DEC 89 680P

NOV 81 907P

PERSONAL AUTHORS: Johnson, A. W.; Loper, Gary L.; Sigmon, T. W.

PERSONAL AUTHORS: Cohen, Bernard

CONTRACT NO. AFOSR-89-0142

CONTRACT NO. AFOSR-80-0277

PROJECT NO. 2301, 2306

TASK NO. A1, B1

MONITOR: AFOSR  
TR-90-0113

MONITOR: AFOSR  
TR-90-0052

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## UNCLASSIFIED REPORT

Availability: Materials Research Society, 9800 McKnight Rd., Pittsburgh, PA 15237. HC \$49.00. No copies furnished by DTIC/NTIS.

Availability: New York Academy of Sciences, 2 East 63rd St., New York, NY 10021. PC \$177.00. No copies furnished by DTIC/NTIS.

ABSTRACT: (U) The Materials Research Society held their symposium 'Laser & Particle-Beam Chemical Processes on Surfaces' in Boston, Massachusetts on November 28 - December 3, 1988. Parts I thru X of this report discuss the following research topics: Overview of Laser- and Beam-Induced Surface Processes; Laser-Induced Deposition of Metal Films; Laser-Induced Writing of Metal Lines; Laser-Induced Deposition of Semiconductors; Laser-Induced Chemical Etching; Laser-Induced Surface Ablation; Laser-Induced Surface Modification; Ion-, Electron-, and Plasma-Assisted Chemistry; and Integrated Circuits Fabricated Technology. (JG)

DESCRIPTORS: (U) \*LASERS, ABLATION, CHEMICAL REACTIONS, CHEMICALS, DEPOSITION, ETCHING, LASER DAMAGE, MASSACHUSETTS, MATERIALS, METAL FILMS, MODIFICATION, PARTICLE BEAMS, SEMICONDUCTORS, SOCIETIES, SURFACES, WRITING.

IDENTIFIERS: (U) PE81102F, WUAFOSR2301A1, WUAFORS2306B1.

AD-A217 804

AD-A217 803

## UNCLASSIFIED

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ABSTRACT: (U) Rapid progress has been made in recent years toward understanding how the central nervous system processes visual and vestibular signals to produce eye movements and body postural responses. One of the most fascinating developments has been the discovery that many neurons in the central vestibular system fire in relation to the velocity of head movement, and respond to any sensory input that would be utilized in initiating or sustaining ocular nystagmus and the sense of movement. Of these extralabyrinthine inputs, that from the visual system is one of the strongest. Most cells in the rostral medial vestibular nucleus of the alert monkey can be activated by visual stimulation. Adding to the activity of central vestibular neurons are neural networks that superpose the inputs from various sensory systems, store activity, and feed it back to alter the characteristics of the vestibulo-ocular reflex so that it more faithfully compensates for head movement. As a result, activity of vestibular nuclei neurons during head rotation at low frequencies is much different than the firing rates of receptor cells in the semicircular canals. Keywords: Graviception, Full field motion, Visual spinal vestibular interactions, Central vestibular and oculomotor disorders. (kr)

DESCRIPTORS: (U) \*CENTRAL NERVOUS SYSTEM, \*OCULOMOTOR NERVE, ACTIVATION, CELLS, EYE, EYE MOVEMENTS, FIRES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 803 CONTINUED

AD-A217 800 7/2 20/5

FIRING RATES, HEAD (ANATOMY), HUMAN BODY, INPUT, LOW  
FREQUENCY, MOTION, NERVE CELLS, NEURAL NETS, NUCLEI,  
NYSTAGMUS, OPTICAL IMAGES, POSTURE (GENERAL),  
RESPONSE (BIOLOGY), ROTATION, SEMICIRCULAR CANALS, SENSE  
ORGANS, SENSES (PHYSIOLOGY), STIMULATION (GENERAL),  
VESTIBULAR APPARATUS.

IDAHO UNIV MOSCOW

(U) Gas-Phase Molecular Structure of Chromium  
Oxytetrafluoride, CrOF(4).

DESCRIPTIVE NOTE: Journal article.

IDENTIFIERS: (U) \*Vestibular nerve.

88

PERSONAL AUTHORS: Huang, Jinfan; Hedberg, Kenneth;  
Streeve, Jean ne M.; Mallela, S. P.

CONTRACT NO. AFOSR-87-0067, NSF-CHE84-11165

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0134

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v27  
p4633-4635 1988.

ABSTRACT: (U) An electron-diffraction study of gaseous  
Chromium Oxytetrafluoride at 42-45 C has been carried out.  
The structure analysis was based on r(alpha) distance  
models; the approximate quadratic force field required by  
this approach was adjusted to fit the observed IR  
frequencies and estimated for the unobserved Raman-active  
modes. The diffraction data are consistent with a  
molecule of C(4v) symmetry, but small deviations from  
that symmetry cannot be ruled out. The structure is  
compared with those of other group 6 five-coordinate  
molecules. Keywords: Gas phase electron diffraction.  
Molecular structure, Reprints. (jg)

DESCRIPTORS: (U) \*MOLECULAR STRUCTURE, DIFFRACTION,  
ELECTRON DIFFRACTION, REPRINTS, STRUCTURAL ANALYSIS,  
VAPOR PHASES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2; \*Chromium  
Oxytetrafluoride.

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CALIFORNIA UNIV DAVIS

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

(U) Aerodynamic and Kinetic Processes in Flames.

DESCRIPTIVE NOTE: Final rept. 1 Mar 85-28 Feb 89,

SEP 89

PERSONAL AUTHORS: Tishkoff, Julian; Law, Chung K.

CONTRACT NO. AFOSR-85-0147

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-90-0087

UNCLASSIFIED REPORT

**ABSTRACT:** (U) An extensive experimental, numerical and analytical study of the dynamics and chemical kinetics of flames was conducted. Specific phenomena investigated included an asymptotic simulation of hydrocarbon oxidation kinetics, an analysis of nonadiabatic flame propagation in dissociation equilibrium, a 3-step modeling of diffusion flames, detailed experimental and numerical determination of the laminar flame speeds of methane/air mixtures, experimental and analytical quantification of the propagation, extinction and interaction of laminar flames, experimental quantification of the structure and propagation of turbulent premixed flames in stagnation flow, and the influence of dilution, inert addition, preferential diffusion, and aerodynamic straining on soot formation in diffusion flames. A total of fourteen journal publications resulted from the present program. Keywords: Flame dynamics; Flame kinetics; Turbulent flames; Soot formation; Methane air combustion. (edc)

**DESCRIPTORS:** (U) \*FLAME PROPAGATION, \*FLAMES, ADDITION, AERODYNAMICS, AIR, COMBUSTION, DIFFUSION, DILUTION, DISSOCIATION, DYNAMICS, CHEMICAL EQUILIBRIUM, EXTINCTION, FLOW, HYDROCARBONS, INERT MATERIALS, INTERACTIONS, KINETICS, LAMINAR FLOW, METHANE, MIXING, MIXTURES, NUMERICAL ANALYSIS, OXIDATION, REACTION KINETICS, SOOT, STAGNATION, TURBULENCE, VELOCITY.

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AD-A217 788 7/6

AD-A217 787 12/1 14/2

BATTLE COLUMBUS DIV WASHINGTON DC

MARYLAND UNIV BALTIMORE

(U) Three-Dimensional Photochemical Machining with Lasers.

(U) Control Theory and Partial Differential Equations.

DESCRIPTIVE NOTE: Quarterly research and development status rept. no. 5, 1 Aug 83-31 Oct 83.

DESCRIPTIVE NOTE: Progress rept. Jun 82-Dec 83.

NOV 83

DEC 83

PERSONAL AUTHORS: Schwerzel, Robert E.

PERSONAL AUTHORS: Seidman, Thomas I.

CONTRACT NO. F49620-82-C-0077

CONTRACT NO. AFOSR-82-0271

MONITOR: AFOSR

MONITOR: AFOSR  
TR-90-0027

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ABSTRACT: (U) Our research efforts during this reporting period have focused on (a) continuing to investigate and characterize the brominated protoporphyrin photoinitiator system we discovered during the second quarter's research, (b) continuing our search for other candidate materials which offer the promise of providing selective photopolymerization when irradiated simultaneously with two laser beams of different colors, but of being inert to the presence of either beam alone, and (c) conducting a detailed study of several porphyrin-based photoinitiator molecules in a different monomer system which has been selected because of its ability to crosslink readily. In particular, we have been studying the behavior of our porphyrin initiators and sensitizers in the monomer, trimethylolpropanetriacrylate (TMPTA). This polymer system crosslinks and hardens very efficiently upon two-beam irradiation using several of our novel brominated porphyrin photoinitiators, as well as with a two-component photoinitiator system consisting of tetraphenylporphyrin and naphthalene sulfonyl chloride. (aw)

ABSTRACT: (U) This document describes research activity supported under this grant from its inception (June, 1982) to the present. Keywords: One-phase Stefan problem; Harmonic analysis; Average power boundedness; Maps; Semiconductor device; Quasi-deterministic switching rules (e.g., a thermostat). (KR)

DESCRIPTORS: (U) \*CONTROL THEORY, \*PARTIAL DIFFERENTIAL EQUATIONS, HARMONIC ANALYSIS, SEMICONDUCTOR DEVICES.

DESCRIPTORS: (U) \*MONOMERS, BEAMS(RADIATION), CHLORIDES, COLORS, CROSSLINKING(CHEMISTRY), EXPLOSIVES INITIATORS, IRRADIATION, LASER BEAMS, LASERS, MACHINING, NAPHTHALENES, PHOTOCHEMICAL REACTIONS, PORPHYRINS, SULFONYL HALIDES, THREE DIMENSIONAL.

IDENTIFIERS: (U) ARPA Order-4522.

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

(U) The Design of High-Performance Circuits for Digital Signal Processing.

DESCRIPTIVE NOTE: Final rept. 1 May 86-31 May 89.

JAN 90

PERSONAL AUTHORS: Allen, Jonathan

CONTRACT NO. AFOSR-86-0164

PROJECT NO. 2305

TASK NO. B3

MONITOR: AFOSR  
TR-90-0012

UNCLASSIFIED REPORT

**ABSTRACT:** (U) In order to place the research done under this contract in perspective, we start by describing the view of integrated circuit design that motivates our work. Our goal is to provide CAD design tools that enable the production of high-performance chips quickly, correctly, and economically, with particular emphasis on digital signal processing. It is the high-performance aspect of the design that has been our particular emphasis. We consider performance to have two aspects. Aspects of performance associated with circuit style and technology are extremely important, since there is continuing improvement in integrated circuit technology, and also because of the constant invention of new circuit forms that provide for faster performance without excessive demands on power. An additional goal at the circuit and layout level is the minimization of area, since this leads to small circuits with minimum length interconnect. In addition to circuit-oriented performance, however, there is also another aspect of performance that we call architectural performance. By this factor, we refer to the parallelism that is contained in a variety of different algorithms. Parallelism can be exploited through the use of pipelining, multiprocessing, and a variety of other architectural schemes. Since the emphasis in this contract is on digital signal processing

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algorithms, architectural performance is particularly important, since many digital signal processing algorithms have a very large amount of inherent parallelism. In this contract, we have performed explicit studies which show the interaction between circuit technology and architectural parallelism. (rh)

DESCRIPTORS: (U) \*SIGNAL PROCESSING, ALGORITHMS, ARCHITECTURE, CHIPS(ELECTRONICS), CIRCUITS, DIGITAL SYSTEMS, EXPERIMENTAL DESIGN, INTEGRATED CIRCUITS, INVENTIONS, MULTIPROCESSORS, PERFORMANCE(ENGINEERING), PRODUCTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B3.

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AD-A217 783 6/11 6/5

COLORADO UNIV AT BOULDER DEPT OF AEROSPACE ENGINEERING SCIENCES

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

(U) Unsteady Flow Separation and Attachment Induced by Pitching Airfoils.

(U) Mechanisms of Chemical Modulation and Toxicity of the Immune System.

JAN 83

DESCRIPTIVE NOTE: Final rept. 15 Apr 86-14 Oct 89.

DEC 89

PERSONAL AUTHORS: Robinson, Michael C.; Luttgies, Marvin W.

PERSONAL AUTHORS: Tarr, Melinda J.

CONTRACT NO. AFOSR-81-0057

REPORT NO. \$AFOSR-86-0129

MONITOR: AFOSR

TR-90-0028

PROJECT NO. 2312

UNCLASSIFIED REPORT

TASK NO. A5

MONITOR: AFOSR

TR-90-0086

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The dynamics of induced, separated vortices generated from sinusoidal airfoil oscillations were examined across a range of unsteady flow parameters. Leading edge vortical initiation, development, and interaction with trailing edge vorticity were summarized via stroboscopic flow visualization and hotwire anemometry. Results indicate the sensitivity of vortical development at both leading and trailing edges to reduced frequency parameter and magnitude of oscillation angle. Certain optimal parametric conditions resulted in dramatic interactions of leading and trailing edge vorticity. At diminished oscillation angles, separated flow attachment was evident in the absence of the large induced vortical structures characteristic of large oscillation amplitudes. (sdw)

**DESCRIPTORS:** (U) \*FLOW SEPARATION, \*PITCH(MOTION), \*UNSTEADY FLOW, AIRFOILS, AMPLITUDE, ANGLES, ATTACHMENT, DYNAMICS, FREQUENCY, HOT WIRE ANEMOMETERS, LEADING EDGES, OPTIMIZATION, OSCILLATION, PARAMETERS, PARAMETRIC ANALYSIS, REDUCTION, SENSITIVITY, SEPARATION, STRUCTURES, TRAILING EDGES, VORTICES.

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**ABSTRACT:** (U) The final three and a half years of our research with 1,1-dimethylhydrazine (UDMH) have focused on delineating the mechanisms of UDMH-induced immunomodulation. Actions of UDMH which could correlate with its immunoenhancement effects include: 1.) Interference with interleukin 2 (IL2) activity by suppression of IL2 receptor expression; 2.) Nonspecific stimulation of intracellular ionized calcium levels in lymphocytes; 3.) Interference with activated macrophage suppressive effects (as evidenced by reversal of Corynebacterium parvum-induced immunosuppression, as well as interference with chemiluminescence and prostaglandin E2 production). Other mechanisms for the immunomodulatory effects of UDMH which were ruled out include: 1.) UDMH does not interfere with the production or activity of hydrogen peroxide, a 'normal' endogenous immunosuppressant; 2.) UDMH does not alter the absolute or relative numbers of the T-lymphocyte subsets L3T4 (helper cells), Lyt-2 (suppressor/cytotoxic cells), or Thy1.2 (all T cells); 3.) Ia antigen (immune response antigen) expression is also not affected by UDMH. One other effect of UDMH is suppression of interleukin 1 (IL1) activity by interfering with IL1 receptor expression. We are still investigating the effects on lymphocyte membrane potential and on the production and activity of Soluble Immune Response Suppressor (SIRS).

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JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*IMMUNITY, \*TOXICITY, ACTIVATION, ANTIGENS, CALCIUM, CELLS, CELLS(BIOLOGY), CHEMICALS, CHEMILUMINESCENCE, CYTOTOXIN, HYDROGEN PEROXIDE, IONIZATION, LYMPHOCYTES, MEMBRANES, MODULATION, NUMBERS, PHAGOCYTES, PRODUCTION, RESPONSE(BIOLOGY), RETICULOENDOTHELIAL SYSTEM, SOLUBILITY, STIMULATION(GENERAL), SUPPRESSION, SUPPRESSORS.

(U) Theoretical Studies of Spin-Forbidden Processes within the Breit-Pauli Approximation.

DESCRIPTIVE NOTE: Final rept. 1 Jul 86-31 Oct 89,

JAN 90

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A5 \*T Lymphocytes.

PERSONAL AUTHORS: Yarkony, David R.

CONTRACT NO. AFOSR-86-0110

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0081

UNCLASSIFIED REPORT

ABSTRACT: (U) This program considered the electronic structure aspects of radiative and radiationless decay processes related to the stability and formation of high energy density materials. To accomplish this goal a unique system of electronic structure algorithms, the BROOKLYN programs, has been developed. These programs provide advanced capabilities for the study of the electronic structure aspects of spin-forbidden and electronically nonadiabatic processes. The methodology is based exclusively on large scale configuration state function expansions (100000 - 1000000 terms). These methods permit significant contributions to the understanding of radiative and radiationless decay processes. Problems of particular relevance to the high energy density materials program include: (i) a study of the possible stability of the energetic maximum ionicity state (HeH)+ to H-; (ii) a study of the spin-forbidden decay mechanism of the model azide system N3H(1A') yields N2(1 Sigma (+) sub g) + NH(X 3Sigma(-)) and finally a study of the decay pathways for the metastable excited state of the helium atom, He(23S), resulting from collisions with other (ground state) helium atoms. Finally a new phase of program development has been initiated focusing on the efficient determination of regions of allowed and avoided crossings of potential energy surfaces using analytic gradient techniques. This

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Program development will provide powerful new tools for the study of spin-forbidden and electronically nonadiabatic processes. (Jhd)

DESCRIPTORS: (U) \*HELIUM, \*HIGH DENSITY, \*MATERIALS, \*RADIOACTIVE DECAY, ALGORITHMS, ATOMS, ELECTRONICS, GRADIENTS, GROUND STATE, HIGH ENERGY, MATHEMATICAL ANALYSIS, METASTABLE STATE, POTENTIAL ENERGY, RADIATION, SURFACES, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383, BROOKLYN computer program.

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MICHIGAN UNIV ANN ARBOR DIV OF RESEARCH DEVELOPMENT AND ADMINISTRATION

(U) Influence of Lipid Composition in Amplifying or Ameliorating Toxicant Effects on Phytoplankton.

DESCRIPTIVE NOTE: Annual rept. 9 Sep 88-1 Jan 90,

JAN 90

PERSONAL AUTHORS: Goad, Linda S.

CONTRACT NO. AFOSR-88-0315

PROJECT NO. 2312

TASK NO. 44

MONITOR: AFOSR  
TR-90-0008

UNCLASSIFIED REPORT

ABSTRACT: (U) Research conducted under this grant has demonstrated that lipid content and composition of diatoms varied greatly during the growth cycle. More variation was found over a 24 hour period. A portion of the lipid content response was found to be entrained with the light/dark regime. However, the data also suggested that a portion of the lipid cycling was not entrained with the light/dark regime, but may be under control of other biological rhythms. Preliminary toxicant exposure experiments have suggested that the time of day when algae are exposed to toxicants may alter physiological responses to the toxicant. Keywords: Diurnal variations. (edc)

DESCRIPTORS: (U) \*LIPIDS, \*PHYTOPLANKTON, ALGAE, BIOLOGICAL RHYTHMS, CONCENTRATION(COMPOSITION), LIFE CYCLES, DARKNESS, DAY, DIURNAL VARIATIONS, ENTRAINMENT, EXPOSURE(PHYSIOLOGY), PLANT GROWTH, LIGHT, PHYSIOLOGICAL EFFECTS, RESPONSE(BIOLOGY), TIME, TOXIC AGENTS, TOXICITY.

IDENTIFIERS: (U) Diatoms, PE61102F, WUAFOSR231244.

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PHYSICAL DYNAMICS INC LA JOLLA CA

IMAGES, INTERFERENCE, INTERNAL, LOOPS, MAGNETIC FIELDS, MATERIALS, METAL PLATES, MICROSCOPES, MICROSCOPY, MILLIMETER WAVES, QUANTUM ELECTRONICS, RESOLUTION, RETINA, RODS, SUPERCONDUCTIVITY, SUPERCONDUCTORS, TEST AND EVALUATION.

(U) Superconductive Microprobes for Eddy Current Evaluation of Materials.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

JUL 89

IDENTIFIERS: (U) SQUIDS(Superconductor Quantum Interference Devices).

PERSONAL AUTHORS: Podney, Walter N.

CONTRACT NO. F49620-88-C-0091

MONITOR: AFOSR  
TR-90-0011

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Superconductive quantum interference devices (SQUIDS) offer new technology for locating materials flaws electromagnetically that promises to increase sensitivity, depth of magnetic flux enables use of microscopic pickup loops in a gradiometer configuration to give high resolution. A cryogenic umbilical connects pickup loops to a remote cryostat housing SQUID sensors to ease scanning. A pair of drive coils a few millimeters in radius that encircle pickup loops forming a coplanar gradiometer 1 mm or less in radius comprise a superconductive microprobe. It provides a depth of field of several millimeters to a 0.1 mm flaw in an aluminum plate, when operating with a drive current of 1 A oscillating at a frequency of 1kHz. Its field of view ranges to several millimeters, for flaws a few millimeters deep, and its horizontal resolution is 1 mm or so, for flaw depths out to its depth of field. An array of microprobes form receptors much like rods in the retina of a magnetic eye. The eye leads to an electromagnetic microscope for imaging internal flaws in aluminum plates. It gives multiple images that enable resolving depth of a 0.1 mm flaw to a few tenths of a millimeter with a horizontal resolution of one millimeter or so. (kr)

**DESCRIPTORS:** (U) \*DEFECT ANALYSIS, \*ELECTROMAGNETIC PROBES, \*MICROPROBES, ALUMINUM, ARRAYS, CEPHALOPODA, COILS, CONFIGURATIONS, DEFECTS(MATERIALS), DEPTH, DRIVES, EDDY CURRENTS, ELECTROMAGNETISM, EYE, FLUX(RATE), GRADIOMETERS, HIGH RESOLUTION, HORIZONTAL ORIENTATION.

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OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

CONSAD RESEARCH CORP PITTSBURGH PA

(U) Theory System Reliability Demonstration and Burn-in Design.

(U) Testing, Evaluation, Augmentation, and Implementation of an Integrated Simulation Evaluation Model Prototype (ISEM-P) of the Air Force Manpower and Personnel System. Volume 1.

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-30 Jun 89,

JUL 89

DESCRIPTIVE NOTE: Final rept. 1 Nov 77-15 Aug 80.

PERSONAL AUTHORS: Blumenthal, Saul

AUG 80

CONTRACT NO. AFOSR-87-0306

CONTRACT NO. F49620-78-C-0001

PROJECT NO. 2304

PROJECT NO. 2313

TASK NO. A5

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR

TR-90-0118

TR-90-0169

UNCLASSIFIED REPORT

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ABSTRACT: (U) Research accomplishments were registered in three areas. The first is lifetime estimation with truncated data. Maximum likelihood estimators and their asymptotic properties were studied. A Monte Carlo comparison of several estimators was performed when only interval data on lifetimes is available. The second area is under what conditions a 'burn-in' was developed and tested using sequential estimation. Thirdly, distributions other than Poisson were tried, and it was found that in some cases a binomial approximation provides a more robust testing scheme for series systems with aging components. (sch)

DESCRIPTORS: (U) \*ASYMPTOTIC SERIES, \*ESTIMATES, \*TRUNCATION, AGING(MATERIALS), BINOMIALS, COMPARISON, DEMONSTRATIONS, LIFE SPAN(BIOLOGY), MONTE CARLO METHOD, RELIABILITY, SEQUENCES, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

ABSTRACT: (U) This research involved the testing, evaluation, augmentation, and improvement of the Integrated Simulation Evaluation Model Prototype (ISEM-P), a computerized model which simulates the basic planning activities and decision-making procedures involved in the Air Force Manpower and Personnel System (AFMPS). During the period between November 1, 1977 and May 15, 1980, accomplishments of this research included: installing a fully operational version of the model on the Air Force Human Resources Laboratory (AFHRL) computer; establishing an 'ISEM Working Group' of Air Force personnel actively involved in planning and administering the manpower and personnel assignment and training functions within the AFMPS; developing a set of 'scenario problems' to test the validity of the model; creating improved output reports for displaying the results generated by the model; executing simulation runs for four selected 'scenario problems' and a baseline situation; and modifying the model to eliminate certain identified inconsistencies between the simulation results and observed AFMPS behavior. Changes undertaken as a result of this process involved incorporating the concepts of 'equal promotion opportunity,' cross-training, the 'worldwide manning level,' 'time-in-station,' and 'time-in-CONUS' into the ISEM-P structure. A design for the rated management supplement was also established for potential

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incorporation into ISEM-P. The results of the four 'scenario problems' simulation runs were analysed and compared to the baseline situation.

HOWARD UNIV WASHINGTON DC LASER CHEMISTRY DIV  
(U) A Pulsed Laser and Molecular Beam Apparatus for Surface Studies

DESCRIPTORS: (U) \*BILLET(S)(PERSONNEL), AIR FORCE PERSONNEL, BASE LINES, COMPUTERIZED SIMULATION, DECISION MAKING, FUNCTIONS, GLOBAL, MANPOWER, MODELS, OUTPUT, PERSONNEL, PLANNING, REPORTS, SCENARIOS, SIMULATION, TRAINING, VALIDATION.

DESCRIPTIVE NOTE Final report 15 May 83-15 May 84

MAR 85

PERSONAL AUTHORS JACKSON William M

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A3.

CONTRACT NO AFOSR 83-0280

PROJECT NO. 2917

TASK NO. A3

MONITOR: AFOSR  
TR-90-0016

UNCLASSIFIED REPORT

ABSTRACT: (U) Equipment was purchased, using a grant awarded by the Air Force Office of Scientific Research under the DOD University Instrumentation Program, for the construction of an apparatus for the study of gas-surface interactions. This apparatus uses pulsed lasers both to keep the surface free of contamination and for probing surface phenomena, and pulsed molecular beam sources to dose the surface with the required gaseous samples. The experiments that will be carried out are in part described in the proposal A Pulsed Laser and Molecular Beam Apparatus for Surface Studies submitted by Howard University in November 1982 for review by AFOSR, under the DOD University Instrumentation Program. This report describes the progress made during the granting period in setting up the apparatus, and also the work that will be undertaken in the immediate future. The studies are currently supported by a grant from the Standard Oil Company of Ohio who have awarded us a \$225,000 three-year contract for surface studies in collaboration with the Department of Electrical Engineering (Kri)

DESCRIPTORS: (U) \*MOLECULAR BEAMS, \*PULSED LASERS, COMPANY LEVEL ORGANIZATIONS, CONTAMINATION, ELECTRICAL ENGINEERING, GAS SURFACE INTERACTIONS, GASES, INSTRUMENTATION, OHIO, OILS, PULSES, SAMPLING, SOURCES, SURFACE PROPERTIES, SURFACES, UNIVERSITIES.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2917A3.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) DURIP Optical Equipment for High-Speed Viscous-  
Inviscid Interaction Research.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

JAN 90

PERSONAL AUTHORS: Settles, Gary S.

CONTRACT NO. AFOSR-89-0140

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-90-0074

UNCLASSIFIED REPORT

ABSTRACT: (U) The Penn State Gas Dynamics Lab has an active, ongoing program in experimental high speed fluid dynamics research. The current research of the Laboratory, sponsored by AFOSR, ONR, and NASA, concerns supersonic viscous/inviscid interactions, compressible turbulent mixing, and high-speed vortex dynamics pertaining to external and internal aerodynamics and propulsion. The Laboratory specializes in development and use of advanced, non-intrusive optical flow diagnostics in such research studies. These optical instruments and techniques are brought to bear on basic fluid dynamic experiments in the Penn State Supersonic Wind Tunnel, which has a high Reynolds number capability and continuously-variable Mach number range of Mach 1.5 to 4.0. Optical measurements; Optical equipment; Viscous-inviscid interaction. (enk)

DESCRIPTORS: (U) \*FLUID DYNAMICS, AERODYNAMICS, COMPRESSIBLE FLOW, DIAGNOSIS(GENERAL), DYNAMICS, EXTERNAL FLOW, GAS DYNAMICS, HIGH RATE, INTERACTIONS, INTERNAL, INVISCID FLOW, LABORATORIES, MEASUREMENT, MIXING, OPTICAL ANALYSIS, OPTICAL EQUIPMENT, OPTICAL INSTRUMENTS, OPTICAL PROPERTIES, REYNOLDS NUMBER, SUPERSONIC CHARACTERISTICS, SUPERSONIC WIND TUNNELS, TURBULENT FLOW, VISCOUS FLOW, VORTICES.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2307A1.

COLORADO UNIV AT BOULDER

(U) DURIP Theoretical/Experimental Investigations of  
Highly Energetic Dication Species.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89.

DEC 39

PERSONAL AUTHORS: Lineberger, W. C.; Leone, Stephen R.

CONTRACT NO. AFOSR-89-0087

PROJECT NO. 3842

TASK NO. A2

MONITOR: AFOSR  
TR-90-0125

UNCLASSIFIED REPORT

ABSTRACT: (U) The titanium sapphire laser has been modified with a thick etalon to achieve single frequency scanning capability. The Neodymium:YAG laser and dye laser have been modified with a home-built scanning system. Preliminary investigations using a medium pressure electrical discharge ion source gave reasonable quantities of  $\text{NO}^{++}$  and several other dications. These ions survived the rather severe collisional environment of the ion source. The nature of this source, however, did not permit very controlled formation conditions. Consequently, the ion source has been replaced with an electron impact ionized supersonic expansion source. Construction of this source has been completed, and the first mass spectra of dications have just been obtained. A new ion source has been devised to optimize the production of doubly-charged molecular cations. Using the  $\text{NF}_3$  precursor, the species  $\text{NF}_2^{++}$  and  $\text{NF}^{++}$  are observed. With  $\text{HCL}$  and  $\text{DCL}$  precursors, both  $\text{HCL}^{++}$  and  $\text{DCL}^{++}$  species are observed. Using  $\text{CCl}_4$ , a wide variety of species are formed, including  $\text{GCL}^{++}$ ,  $\text{HCCL}^{++}$ , and  $\text{H}_2\text{CCl}^{++}$ , several of which may be previously unreported. With  $\text{CF}_4$ , we observe  $\text{CF}^{++}$ ,  $\text{CF}_2^{++}$  and  $\text{CF}_3^{++}$ . We also observe the readily made species,  $\text{NO}^{++}$  and  $\text{CO}^{++}$ , starting from their parent neutrals. We are presently working on an eight-photon double ionization process in  $\text{N}_2$  and a ten-photon process for  $\text{N}_2$  (to produce  $\text{NO}^{++}$ ) and

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N2(++), respectively). Keywords: Photodissociation, Energetic properties. (aw)

NATIONAL ACADEMY OF SCIENCES WASHINGTON DC

DESCRIPTORS: (U) \*ION SOURCES, \*MASS SPECTRA, COLLISIONS, CONTROL, DYE LASERS, ENERGETIC PROPERTIES, ENVIRONMENTS, FREQUENCY, HIGH RATE, INTENSITY, IONS, LASERS, NEODYMIUM, PHOTODISSOCIATION, PRODUCTION, SAPPHIRE, SCANNING, THEORY, TITANIUM, YAG LASERS.

(U) Committee on Geodesy - National Research Council.

DESCRIPTIVE NOTE: Final rept. 1 Jun-31 Aug 89,

AUG 90

PERSONAL AUTHORS: Long, Robert S.

IDENTIFIERS: (U) PE61102F, WUAFOSR3842A2.

CONTRACT NO. AFOSR-89-0124

PROJECT NO. 2309

TASK NO. A2

MONITOR: AFOSR  
TR-90-0124

UNCLASSIFIED REPORT

ABSTRACT: (U) The focus was on the applications of geodesy to oceanography, geophysics, space science, surveying, mapping and instrumentation. A report Geodesy in the Year 2000 is under review and will be published during the winter 1989-90. The Committee plans to continue to review the activities and research in geodesy; identify basic research opportunities and applied research needs; and recommend actions to meet future national, societal, scientific and technological demands on geodetic science, including surveying, mapping, and photogrammetry. A panel set up to 1. evaluate the scientific impact of a global network of fiducial sites; 2. examine strategies for implementing and operating such a network in the light of anticipated scientific return using existing capabilities where possible; and 3. assess whether such a network would provide a suitable global infrastructure for geodetic and other geophysical system of the next century. (JHD)

DESCRIPTORS: (U) \*GEODESY, RESEARCH MANAGEMENT, GEOPHYSICS, FORECASTING, IMPACT, OCEANOGRAPHY, PANELS, PHOTOGRAMMETRY, REPORTS, SPACE SCIENCES, SURVEYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2309A2.

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SRI INTERNATIONAL MENLO PARK CA

AD-A217 768 7/4 7/5 20/5

EXPERIMENTAL DATA, HELIUM, HYDROGEN, LASER BEAMS, MOLECULAR BEAMS, MOLECULAR STRUCTURE, MOLECULES, NEUTRAL, PRECISION, SYMMETRY, POLYATOMIC MOLECULES, MOLECULAR PROPERTIES, DEUTERIUM COMPOUNDS.

(U) Electronically Metastable Molecules of High Symmetry.

DESCRIPTIVE NOTE: Interim rept. 1 Nov 88-1 Nov 89,

JAN 90

IDENTIFIERS: (U) LPN-SRI-2915, PE61102F, WUAFOSR2303B1, Hydronium Ion, Deuteronium Ion, Photofragments.

PERSONAL AUTHORS: Helm, Hanspeter

REPORT NO. SRI-MP-90-001

CONTRACT NO. F49620-87-K-0002

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-90-0003

UNCLASSIFIED REPORT

ABSTRACT: (U) In this research, we studied of the metastable electronic states of small molecules such as Tritium. Our goal was to obtain precise information on the origin of metastability in molecular systems of high symmetry and on structural, spectroscopic, and dynamic properties of such species. The research was performed in two experimental setups, both using fast neutral molecular beams that we form by charge transfer of an electron from a suitable donor gas to a mass selected ion. In one set of experiments we illuminate the neutral species by using laser light and detect the appearance of photoions so that we can study photoionization events. In the other we photodissociate the molecule and detect the neutral photofragments by using a position- and time-sensitive detector. This study focused on photodissociation and photoionization processes of triatomic hydrogen. A detailed account of the results obtained on triatomic hydrogen is given below. We also obtained new experimental data on the metastable species of Diatomic hydrogen, Diatomic Helium, Hydronium, and D30. Keywords: Deuterium compounds. (av)

DESCRIPTORS: (U) \*ELECTRONIC STATES, \*METASTABLE STATE, \*PHOTOIONIZATION, \*TRITIUM, \*PHOTODISSOCIATION, CHARGE TRANSFER, DIATOMIC MOLECULES, DYNAMICS, ELECTRONS,

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK MATERIALS  
RESEARCH LAB

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A3, \*Sol-Gel  
Process.

(U) Exploitation of the Sol-Gel Route in Processing  
Ceramics and Composites.

DESCRIPTIVE NOTE: Final rept. 15 May 83-14 May 85.

MAY 85

PERSONAL AUTHORS: Roy, Rustum

CONTRACT NO. AFOSR-83-0212

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-90-0019

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The sol-gel process for making ceramic powders from solutions-gels, and especially the use of alkoxide precursors, and their subsequent conversion of gels to ultrahomogeneous glass was developed at Penn State by the P.I. and his students. Our conceptual innovation on which the present work rests is, we believe, as major a development as was our development of the sol-gel processing in the decade 1948-58. In that development we succeeded in making ceramics that were homogeneous on the 'unit cell' scale. Since 1982 we conceived and first published and filed patents on and what we have now developed in detail is deliberate heterogeneity on the same scale (1-10 nm units). The work under this grant is focused on applications and processing, while the thermodynamics and structure of this family of heterogeneous materials is studied under a parallel NSF grant. **Keywords:** Ceramic composites; Xerogels; Sintering; Melting; Nucleation; Epitaxial growth; Chemical properties; Ultra fine; Microstructure; Colloids; Titania silica glass. (JG)

**DESCRIPTORS:** (U) \*CERAMIC MATERIALS, \*POWDERS, CHEMICAL PROPERTIES, COLLOIDS, COMPOSITE MATERIALS, CONVERSION, EPITAXIAL GROWTH, GELS, MICROSTRUCTURE, NUCLEATION, PATENTS, SINTERING, THERMODYNAMICS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 765 12/5

MARYLAND UNIV COLLEGE PARK DEPT OF COMPUTER SCIENCE  
(U) Research in Programming Languages and Software Engineering.

DESCRIPTIVE NOTE: Final rept. 1 Mar 87-31 Oct 89.

JAN 90

PERSONAL AUTHORS: Basili, Victor R.; Gannon, John D.; Zeikowitz, Marvin V.

CONTRACT NO. AFOSR-87-0130

PROJECT NO. 2304

TASK NO. A2

MONITOR: AFOSR  
TR-90-0077

UNCLASSIFIED REPORT

ABSTRACT: (U) The projects presented in this report encompass developing and integrating the concepts and models used in the TAME measurement environment, using syntax-editing technology to develop formal specifications, investigating the impact of functional specification and development on software construction, designing and evaluating a new exception handling mechanism, and transforming computations for single processors to execute efficiently on non-shared memory multiprocessors. (emk)

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, COMPUTATIONS, COMPUTER PROGRAMS, CONSTRUCTION, ENVIRONMENTS, HANDLING, IMPACT, MEASUREMENT, PROGRAMMING LANGUAGES, SPECIFICATIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A2.

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UNCLASSIFIED

AD-A217 763 7/4 7/5

CALIFORNIA INST OF TECH PASADENA ARTHUR AMOS NOYES LAB OF CHEMICAL PHYSICS

(U) Femtosecond Real-Time Probing of Reactions. 4. The Reactions of Alkali Halides.

DEC 89

PERSONAL AUTHORS: Rose, Todd S.; Rosker, Mark J.; Zewail, Ahmed H.

CONTRACT NO. AFOSR-87-0071

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-90-0108

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics. v91 n12 p7415-7436, 15 Dec 89.

ABSTRACT: (U) The photodissociation dynamics of some alkali halides are explored via the method of femtosecond transition-state spectroscopy (FTS). The alkali halide dissociation reaction is influenced by the interaction between the covalent and the ground state ionic potential energy surfaces (PES), which cross at a certain internuclear separation. Depending upon the adiabaticity of the PES, the dissociating fragments may be trapped in a well formed by the avoided crossing of these surfaces. Here, we detail the FTS results of this class of reactions, with particular focus on the reaction of sodium iodide:  $\text{NaI}^* \text{ yields } (\text{Na}^{--}\text{I})^* \text{ yields } \text{Na}\cdot\text{I}$ . We observe the dynamical motion of the wave packet along the reaction coordinate and the crossing between the covalent and ionic surfaces. The studies presented here characterize the effects of various experimental parameters, including pump and probe wavelengths, on the dynamics of the dissociation and its detection. Comparisons of the results with classical and quantum mechanical calculations are also presented. Keywords: Real-time; Reprints. (AW)

DESCRIPTORS: (U) \*IODIDES, \*PHOTODISSOCIATION, \*SODIUM

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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COMPOUNDS, \*SURFACE REACTIONS, ALKALI METAL COMPOUNDS, COORDINATES, DETECTION, DYNAMICS, FREQUENCY, HALIDES, MOTION, PARAMETERS, PROBES, QUANTUM STATISTICS, QUANTUM THEORY, REPRINTS, RESPONSE, SPECTROSCOPY, TRANSITIONS, WAVE PACKETS, POTENTIAL ENERGY, CROSSINGS, COVALENT BONDS, IONS, REAL TIME.

IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

(U) Insertion of Nitriles into the Nitrogen-Chlorine Bond.  
Synthesis of Polyfluoro- and (Perfluoroalkyl) tetrazanes.

88

IDENTIFIERS: (U) PEG1102F, WUAFOSR230381, Fentosecond Transition State Spectroscopy, FTS(Fentosecond Transition State Spectroscopy), PES(Potential Energy Surfaces), Potential Energy Surfaces.

PERSONAL AUTHORS: Sarwar, Ghulam; Kirchmeier, Robert L.; Shreeve, Jeanne M.

CONTRACT NO. AFOSR-87-0067

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0135

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28 p3345-3349 1989.

ABSTRACT: (U) Both fluorinated and non-fluorinated olefins can be inserted with ease into the nitrogen-halogen bond, e.g., hexafluoropropane or ethylene into the nitrogen-halogen bond of bromo- or iodobis(trifluoromethyl)-amine or olefins into chlorobis(trifluoromethyl)amine. We reported the stepwise insertion of  $CF_2=CFX$  ( $X = Cl, F$ ) into the N-Cl bonds of dichloro(perfluoroalkyl)amines. Insertions of cyanogen chloride and/or trifluoroacetonitrile into nitrogen-chlorine bonds, e.g., in chlorobis(trifluoromethyl)amine. Chlorine fluoride, Carbon-nitrogen double bond, Nitrile, Elimination tetrazane perfluoroalkyl, Highly catenated nitrogen compounds, Stable, Dense fluids, Dimers, Reprints. (Jg)

DESCRIPTORS: (U) \*CHLORINE, \*NITROGEN, ETHYLENE, FLUIDS, HIGH DENSITY, REPRINTS, STABILITY, SYNTHESIS, FLUORINATED HYDROCARBONS, OLEFIN POLYMERS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230382.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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IDAHO UNIV MOSCOW DEPT OF CHEMISTRY

(U) Insertion of Tetrafluoroethylene and  
Trifluorochloroethylene into Nitrogen-Chlorine Bonds.  
A New Route to Perfluoroazaalkenes,

89

PERSONAL AUTHORS: Sarwar, Ghulam; Kirchmeier, Robert L.;  
Shreeve, Jean ne M.

CONTRACT NO. AFOSR-87-0067

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0136

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v28  
p2187-2189 1989.

ABSTRACT: (U) Insertion of olefins,  $CF_2=CFX$  ( $X = Cl, F$ ), into the nitrogen-chlorine bonds of dichloro(perfluoroalkyl)amines.  $R(f)NCl_2$  ( $R(f) = CF_3, C_2F_5$ ), occurs readily, providing an easy, straightforward route to a secondary (polyfluoroalkyl)- or (perfluoroalkyl)chloroamines and tertiary (polyfluoroalkyl)- or (perfluoroalkyl)amines. At 65-70 C, insertion into only one of the nitrogen-chlorine bonds occurs to give  $R(f)N(CF_2CFXCl)Cl$ , while at 90-100 C, insertion into both nitrogen-chlorine bonds produces the tertiary amine  $R(f)N(CF_2CFXCl)_2$  in good yield. Gas-phase photolysis of  $R(f)N(CF_2CFXCl)Cl$  results in essentially quantitative yields of the respective perfluoroazaalkenes,  $R(f)N=CF_2$ , and fluorocarbons,  $CFXCl_2$  ( $X = F, Cl$ ). Reprints. (jg)

DESCRIPTORS: (U) \*FLUORINATED HYDROCARBONS, AMINES, REPRINTS, PHOTOLYSIS, OLEFIN POLYMERS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Nitrogen-Chlorine bonds, Alkenes.

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

(U) Synthesis and Photodegradation of Poly(2,5-bis(dimethylsilyl)furan),

89

PERSONAL AUTHORS: Hong, Harry H.; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-90-0137

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polymer Bulletin, v22 p363-369 1989.

ABSTRACT: (U) Poly (2,5-bis(dimethylsilyl)furan) (V), a copolymer with alternating furan and disilyl units, has been prepared by the Wurtz coupling of 2,5-bis(dimethylchlorosilyl)furan (II) with sodium metal dispersion in toluene. Lower molecular weight poly(2,5-bis(dimethylsilyl)furan (IV) has been prepared by a similar condensation reaction with 2,5-bis-(dimethylfluorosilyl)furan (III). IV and V have been characterized by Hydrogen 1, Carbon 13, and Silicon 29 NMR, IR, and UV spectroscopy as well as by GPC, TGA and elemental analysis. Photolysis of V in a benzene/methanol solution results in degradation of the polymer. Alternate copolymers, Disilyl, Photodegradation. Reprints. (jg)

DESCRIPTORS: (U) \*COPOLYMERS, \*FURANS, \*PHOTODEGRADATION, BENZENE, CONDENSATION REACTIONS, DEGRADATION, DISPERSING, LIGHTWEIGHT, METALS, METHANOLS, MOLECULAR WEIGHT, PHOTOLYSIS, POLYMERS, SODIUM, SOLUTIONS(GENERAL), SYNTHESIS, TOLUENES, ULTRAVIOLET SPECTROSCOPY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INSTUNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

(U) Synthesis and Photodegradation of Poly(1,4-bis(dimethylsilyl)naphthalene),

(U) Anionic Ring Opening Polymerization of 3,4-benzo-1,1-dimethyl-1-silacyclopentene. Properties of Poly(3,4-benzo-1,1-dimethyl-1-silapentene),

89

89

PERSONAL AUTHORS: Lee, Shih-Jen H.; Weber, William P.

PERSONAL AUTHORS: Park, Young T.; Zhou, Qingshan; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

CONTRACT NO. AFOSR-89-0007

TASK NO. B2

PROJECT NO. 2303

MONITOR: AFOSR  
TR-90-0139MONITOR: AFOSR  
TR-90-0138

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polymer Bulletin, v22 p355-362 1989.

SUPPLEMENTARY NOTE: Pub. in Polymer Bulletin, v22 p349-353 1989.

ABSTRACT: (U) Poly(1,4-bis(dimethylsilyl)naphthalene (I), a copolymer with alternating 1,4-naphthalene and disilyl units, has been prepared by the Wurtz coupling of 1,4-bis(dimethylchlorosilyl)-naphthalene (II) or 1,4-bis(dimethylfluorosilyl)naphthalene (III) with sodium metal dispersion in toluene. The molecular weight distribution of I prepared from III is significantly higher than when I is prepared from II. Photolysis of I in benzene/methanol solution results in rapid degradation of I. Alternate copolymers, Wurtz coupling, Polysilanes. Reprints. (jg)

DESCRIPTORS: (U) \*COPOLYMERS, \*DEGRADATION, \*SYNTHESIS, \*NAPHTHALENES, BENZENE, DISPERSING, DISTRIBUTION, METALS, METHANOLS, MOLECULAR WEIGHT, PHOTOLYSIS, POLYSILANES, SODIUM, SOLUTIONS(GENERAL), TOLUENES.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382.

DESCRIPTORS: (U) \*POLYMERIZATION, AMIDES, ANIONS, GLASS, HIGH TEMPERATURE, MELTING POINT, METHYL RADICALS, OPENING(PROCESS), PHOSPHORS, REPRINTS, RINGS, THERMAL STABILITY, TRANSITION TEMPERATURE, PENTODES.

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NATIONAL INST OF STANDARDS AND TECHNOLOGY GAITHERSBURG  
MD CERAMICS DIV

IDENTIFIERS: (U) Monophase ceramics, Toughening,  
PE61102F, WJAFOSR2306A2.

(U) Strength and Microstructure of Ceramics.

DESCRIPTIVE NOTE: Final technical rept. 1987-1989.

NOV 89

PERSONAL AUTHORS: Lawn, Brian R.; Alpert, C. J.; Bennison,  
S. J.

CONTRACT NO. AFOSR-ISSA-87-0034, SAFOSR-ISSA-88-0005

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-90-0013

UNCLASSIFIED REPORT

ABSTRACT: (U) Results of a study program on the toughness properties of monophase ceramics are summarized. In situ observations of crack propagation in alumina and other monophase ceramics show crack interface bridging to be the principal source of increasing toughness with crack size, i.e. R-curve behavior. Fracture mechanics models describing this behavior, in the particular context of strength, are developed. Results of strengths tests confirming the essential predictions of the theory are presented. Results of wear and fatigue tests are also described. The model has strong implications concerning the controlled processing of ceramics for optimum toughness and strength properties. Keywords: Strength mechanics; Fracture resistance; Brittleness; Heat treatment; Toughening; Mechanical properties. (EDC)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*CRACK PROPAGATION, \*MICROSTRUCTURE, ALUMINUM OXIDES, BRITTLENESS, CONTROL, CRACKS, FATIGUE TESTS(MECHANICS), FRACTURE(MECHANICS), HEAT TREATMENT, INTERFACES, MECHANICAL PROPERTIES, MATHEMATICAL MODELS, OPTIMIZATION, PREDICTIONS, PROCESSING, RESISTANCE, SIZES(DIMENSIONS), STRENGTH(MECHANICS), TEST AND EVALUATION, THEORY, TOUGHNESS, WEAR.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF OPERATIONS  
RESEARCH

STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Molecular Dynamics and Spectroscopy at Gas-Solid  
Interfaces.

(U) Research in Reliability, Availability and  
Maintainability for Complex Failure Systems.

DESCRIPTIVE NOTE: Final rept. no. 114, 1 Oct 85-30 Nov 89.

DESCRIPTIVE NOTE: Final rept.,

JAN 90

JAN 90

PERSONAL AUTHORS: George, Thomas F.

PERSONAL AUTHORS: Fishman, G. S.; Kulkarni, V. G.; Provan,  
J. S.

CONTRACT NO. F49620-86-C-0009

CONTRACT NO. AFOSR-84-0140

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B3

TASK NO. A5

MONITOR: AFOSR  
TR-90-0120

MONITOR: AFOSR  
TR-90-0002

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report presents an overview of work performed on AFOSR Grant 84-0140 by G.S. Fishman, V.G. Kulkarni and J.S. Provan during the period June 1, 1984 through November 30, 1989 in the Department of Operations Research at the University of North Carolina at Chapel Hill. This grant was awarded to the three principal investigators in response to their submitted proposal to AFOSR's 1983 initiative in reliability. The work performed on this grant has focused on developing efficient methods of evaluating reliability. This topic is approached through medium of Monte Carlo experimentation, the exploitation of special probabilistic structure and special network structure. Parts I, II and III describe the contributions of each principal investigator separately. (JHD)

DESCRIPTORS: (U) \*FAILURE, \*RELIABILITY, EFFICIENCY,  
MAINTAINABILITY, NETWORKS, RESEARCH MANAGEMENT, NORTH  
CAROLINA, OPERATIONS RESEARCH, PROBABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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ABSTRACT: (U) Progress was made in the development of theories and computational programs for the following topics: infrared-laser-excited adspecies, including energy and phase relaxation, and desorption; ultraviolet-laser-induced chemical vapor deposition; resonance fluorescence at flat surfaces; photochemistry at structured surfaces, including gratings and thin films; phase-conjugated surfaces; spectroscopy in solid matrices; and nonlinear optical process in polymeric systems. (aw)

DESCRIPTORS: (U) \*MOLECULAR PROPERTIES, \*PHOTOCHEMICAL REACTIONS, \*SPECTROSCOPY, \*GAS SURFACE INTERACTIONS, COMPUTATIONS, DESORPTION, DYNAMICS, FLUORESCENCE, GASES, INTERFACES, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, POLYMERS, RELAXATION, RESONANCE, SOLIDS, SURFACES, THEORY, THIN FILMS, VAPOR DEPOSITION.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383.

## UNCLASSIFIED

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND COGNITIVE SCIENCES

(U) Chemical and Electrochemical Studies in Ionic Liquids.

(U) A Process-Grammar for Shape.

DESCRIPTIVE NOTE: Final rept. 1 Dec 86-30 Nov 89.

DESCRIPTIVE NOTE: Rept. for Jul 83-Sep 89.

JAN 90

88

PERSONAL AUTHORS: Osteryoung, Robert A.

PERSONAL AUTHORS: Richards, Whitman

CONTRACT NO. WAFOSR-87-0088

CONTRACT NO. F49620-83-C-0135

PROJECT NO. 2303

PROJECT NO. 2313

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR  
TR-90-0084

MONITOR: AFOSR  
TR-90-0067

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Chemical and electrochemical studies were carried out in ambient temperature chloroaluminate molten salts composed of aluminum chloride and 1-ethyl-3-methylimidazolium chloride. Simultaneous electrochemical in EPR work was performed on polypyrrole and polyfluorene in the molten salts. The chemistry and electrochemistry of a number of solutes, benzoquinone, several molybdenum dimers, and ferro/ferricyanide, were examined. Oxygen 17 NMR spectroscopy was employed to assess the behavior of oxide in the molten salts. Gutmann donor-acceptor numbers were obtained making use of electrochemical and NMR. Phosphorus 31 measurements. Ionic liquids, Ambient temperature molten salts, Electrochemistry, Chloroaluminates. (Jg)

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS, \*CHLORINE COMPOUNDS, ALUMINATES, CHLORIDES, CYANIDES, DIMERS, ELECTROCHEMISTRY, IRON COMPOUNDS, MOLTEN SALTS, MOLYBDENUM, OXIDES, PYRROLES, SPECTROSCOPY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A1, \*Ionic Liquids.

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## UNCLASSIFIED

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SUPPLEMENTARY NOTE: Pub. in Artificial Intelligence, p213 247 1988.

ABSTRACT: (U) Inference rules are developed by which process-history can be recovered from natural shapes such as tumors, clouds, and embryos, etc. We argue that the inference of history arises from a newly discovered duality between curvature extrema and symmetry structure. We also develop a formal grammar by which someone, who has two views of an entity at two developmental stages, can infer the processes that produced the second stage from the first. More specifically, we find that a grammar of only six operations, suffices to express the relationship between any two smooth shapes such that one shape is described the extrapolation of processes inferred in the other under the above inference rules. In fact, a deformation is expressed as a transformation of process records- a technique reminiscent of Chomsky's description of linguistic transformations in terms of transitions between phrase-structured trees. In the present case, our process grammar has the psychological role of explaining the curvature extrema in terms of a sequence of psychologically meaningful deformations. Finally, we compare a process-based symmetry analysis in the literature; and we compare our process-based grammar with another grammar based on curvature extrema. Reprints

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AD-A217 738 20/4

(sdw)

STANFORD UNIV CA THERMOSCIENCES DIV

DESCRIPTORS: (U) \*CURVATURE, \*PHRASE STRUCTURE GRAMMARS,  
CLOUDS, DEFORMATION, EMBRYOS, EXTRAPOLATION, GRAMMARS,  
LINGUISTICS, PSYCHOLOGY, RECORDS, REPRINTS, SHAPE,  
SYMMETRY, TRANSFORMATIONS, TRANSITIONS, TREES.

(U) A Numerical Investigation of the Compressible Mixing  
Layer.

DESCRIPTIVE NOTE: Technical rept.,

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A5.

SEP 89

PERSONAL AUTHORS: Sandham, N. D.; Reynolds, W. D.

REPORT NO. TF-45

CONTRACT NO. F49620-86-K-0022

PROJECT NO. 3484

TASK NO. A1

MONITOR: AFOSR  
TR-90-0001

UNCLASSIFIED REPORT

ABSTRACT: (U) The effect of Mach number on the plane mixing layer has been investigated by means of linear stability theory and two and three dimensional direct numerical simulations of the compressible Navier Stokes equations. The objective was to identify the effects of compressibility on a building block fluid flow, with applications to supersonic mixing and combustion. Results from linear stability theory show that the amplification rate is reduced as Mach number is increased. Above a convective Mach number of 0.6 it is found that three dimensional waves are more amplified than two dimensional waves and a simple relation is found to give the orientation of the most amplified waves. It is also shown that the linear stability theory can be used to predict the mixing layer growth rate as a function of velocity ratio, density ratio and Mach number. Three-dimensional simulations with random initial conditions confirm the linear stability result that oblique waves become the most amplified waves at high Mach numbers, with no evidence for any other modes of instability. Simulations beginning with a two-dimensional wave and a pair of equal and opposite oblique waves show a change in the evolved large-scale structure as Mach number is increased. Above a convection Mach number of 0.6 the oblique modes have

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most of the energy in the developed structure, and above a convective Mach number of 1 the two-dimensional instability wave has little effect on flow structure. Similar organized structure was found in a simulation with random initial conditions. No shock waves were found in the three-dimensional simulations, even at convective Mach numbers above 1. (Jhd)

UTAH STATE UNIV LOGAN CENTER FOR ATMOSPHERIC AND SPACE SCIENCES

(U) USU Center of Excellence in Theory and Analysis of the Geo-Plasma Environment.

DESCRIPTIVE NOTE: Final technical rept..

DESCRIPTORS: (U) \*COMPRESSIBLE FLOW, \*JET MIXING FLOW, \*NAVIER STOKES EQUATIONS, \*SUPERSONIC FLOW, AMPLIFICATION, COMBUSTION, CONVECTION, DENSITY, FLUID FLOW, GROWTH(GENERAL), LAYERS, LINEARITY, MACH NUMBER, MIXING, MODULAR CONSTRUCTION, DIGITAL SIMULATION, RATES, RATIOS, SHOCK WAVES, SIMULATION, STABILITY, THEORY, THREE DIMENSIONAL, TWO DIMENSIONAL, VELOCITY.

NOV 89

PERSONAL AUTHORS: Schunk, Robert W.

CONTRACT NO. F49620-86-C-0109

PROJECT NO. 3484

TASK NO. A2

MONITOR: AFOSR  
TR-90-0106

IDENTIFIERS: (U) PE61103F, WUAFOSR3484A1.

UNCLASSIFIED REPORT

ABSTRACT: (U) A team of eleven Ph.D. scientists and several graduate students was assembled at USU to work in close collaboration with scientists at the Air Force Geophysics Lab on a number of problems that are relevant to Air Force systems, including OTH radars, communications, and orbiting space structures. The overall goal of the research was to obtain a better understanding of the basic chemical and physical processes operating in the geoplasmic environment, including the ionosphere, thermosphere, and magnetosphere. Some of the specific tasks included the following: 1) Studies of ionospheric structure and irregularities; 2) Study the feasibility of developing better operational ionospheric models for the Air Force; 3) Conduct model/data comparisons in order to validate the ionospheric models; 4) Study plasma convection characteristics in the high-latitude ionosphere; 5) Study magnetosphere-ionosphere coupling problems; 6) Construct a thermospheric general circulation model; 7) Develop a 3D, time-dependent model of the outer plasmasphere; 8) Develop a 3D, time-dependent MHD model of the earth's magnetosphere; 9) Conduct satellite drag studies; and 10) Study certain spacecraft-environment interaction problems including those related to high-voltage power sources, spacecraft outgassing, and spacecraft charging at LEO.

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CALIFORNIA UNIV BERKELEY DEPT OF MATHEMATICS

altitudes. Keywords: Modeling; Theory; Analysis;  
 Ionosphere; Magnetosphere; Thermosphere; Densities;  
 Temperatures; Velocities; Irregularities; Instabilities.  
 (sdw)

(U) Nonlinear Stability in Fluid and Plasma Dynamics.

DESCRIPTIVE NOTE: Final rept. 30 Sep 87-29 Sep 89.

DESCRIPTORS: (U) \*IONOSPHERE, \*MAGNETOSPHERE,  
 \*PLASMASPHERE, \*PLASMAS(PHYSICS), \*THERMOSPHERE, AIR  
 FORCE, ARTIFICIAL SATELLITES, CHEMICAL REACTIONS,  
 CONVECTION, DRAG, EARTH(PLANET), EXTERNAL, HIGH LATITUDES,  
 HIGH VOLTAGE, INTERACTIONS, IONOSPHERIC MODELS,  
 LABORATORIES, MAGNETOHYDRODYNAMICS, MODELS, ORBITS,  
 OUTGASSING, POWER SUPPLIES, SOURCES, SPACE ENVIRONMENTS,  
 SPACECRAFT, SPACECRAFT CHARGING, STUDENTS, TIME  
 DEPENDENCE.

NOV 89

PERSONAL AUTHORS: Marsden, J. E.

CONTRACT NO. F49620-87-C-0118

PROJECT NO. 6233

TASK NO. 00

MONITOR: AFOSR  
 TR-90-0065

IDENTIFIERS: (U) PE61102F, WUAFOSR3484A2.

UNCLASSIFIED REPORT

ABSTRACT: (U) Major work on the dynamics of coupled rigid bodies was done. We studied both the case of three coupled rigid bodies in the plane, with a complete stability, bifurcation, and chaotic solutions analysis, but also studied the three dimensional case. In the energy-momentum method, for mechanical systems with Hamiltonian  $H$  of the form kinetic energy  $(K)$  plus potential  $(V)$ , a way was found to choose variables that makes the determination of stability conditions sharper and more computable. The poisson brackets of free boundary fluid equations has been determined. In the homogeneous case, it has been shown already that the structure of the bracket is that of a Yang Mills theory for the principal bundle whose total space consists of the embeddings of a given domain in space, the base space is the space of unparametrized fluid shapes and the group as the particle relabeling group. The geometric reasons for the integrability of the planar three point vortex motion is terms of dual pairs appearing in the study of the geometry of Poisson manifolds has been given. The study of the hydrodynamic bifurcations was begun on the example of a rigidly rotating incompressible homogeneous disk. (JHD)

DESCRIPTORS: (U) \*FLUID DYNAMICS, \*PLASMAS(PHYSICS),  
 COUPLING(INTERACTION), DISKS, EQUATIONS, HAMILTONIAN  
 FUNCTIONS, HOMOGENEITY, INCOMPRESSIBILITY, KINETIC ENERGY,

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MECHANICAL COMPONENTS, NONLINEAR SYSTEMS, PARTICLES,  
POISSON DENSITY FUNCTIONS, RIGIDITY, ROTATION, SHAPE,  
SOLUTIONS(General), STABILITY, THREE DIMENSIONAL.

MICHIGAN UNIV ANN ARBOR DEPT OF ELECTRICAL ENGINEERING  
AND COMPUTER SCIENCE

(U) Massively-Parallel Computational Fluid Dynamics.

IDENTIFIERS: (U) Yang Mills Theory, Free Surface,  
Manifolds(Mathematics), PE61102F, WUAFOSR623300.

DESCRIPTIVE NOTE: Final rept. 1 May 88-30 sep 89.

OCT 89

PERSONAL AUTHORS: Calahan, D. A.

CONTRACT NO. AFOSR-88-0212

PROJECT NO. 2304

TASK NO. A2

MONITOR: AFOSR  
TR-90-0079

UNCLASSIFIED REPORT

ABSTRACT: (U) Algorithm development. Implementation of a 3-D Navier Stokes implicit research code for AFDL was initiated. This required the parallel solution of block-tridiagonal system and so was more challenging than the above explicit code. This is being continued in a new AFOSR grant. Connection Machine experiments. To keep abreast of SIMD architecture performance, a series of Fortran and C kernels were studies on the Argonne Laboratory CM-2 during the summer of 1989. It was concluded that the available Fortran 8X implementation of the CM-2 was too inefficient to warrant continued at that time. Keywords: Programming languages; Computer programming; Computer architecture. (UG)

DESCRIPTORS: (U) \*ALGORITHMS, \*PARALLEL PROCESSING,  
\*FLUID DYNAMICS, ARCHITECTURE, CODING, COMPUTER  
ARCHITECTURE, COMPUTER PROGRAMMING, FORTRAN, PROGRAMMING  
LANGUAGES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A2.

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OTIC REPORT BIBLIOGRAPHY

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT  
OF MATHEMATICS

(U) Parallel Algorithms in the Finite Element  
Approximation of Flow Problems.

DESCRIPTIVE NOTE: Final rept. 1 May 88-31 Oct 89,

OCT 89

PERSONAL AUTHORS: Gunzburger, Max D.

CONTRACT NO. AFOSR-88-0197

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-90-0078

UNCLASSIFIED REPORT

ABSTRACT: (U) The topics discussed are the numerical simulation of viscous incompressible flows, the numerical approximation of certain control problems, the analysis and application of centroidal Voronoi grids, and a book on finite element methods for viscous incompressible flows. For the sake of brevity, we will not go into great detail in the following discussion; further information concerning these topics can be gained from the appropriate references listed at the end of this section. (JHD)

DESCRIPTORS: (U) \*FINITE ELEMENT ANALYSIS, \*GRIDS, \*INCOMPRESSIBLE FLOW, \*VISCOUS FLOW, ALGORITHMS, APPROXIMATION(MATHEMATICS), CONTROL, DIGITAL SIMULATION, PARALLEL PROCESSING.

IDENTIFIERS: (U) Voronoi Graphs, PE61102F, WUAFOSR2304A3.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND  
COGNITIVE SCIENCES

(U) Inferring Three-Dimensional Shapes from Two-  
Dimensional Silhouettes.

DESCRIPTIVE NOTE: Rept. for Jul 83-Sep 89.

OCT 87

PERSONAL AUTHORS: Richards, Whitman A.; Koenderink, Jan J.  
; Hoffman, D. D.

CONTRACT NO. F49620-83-C-0135

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-90-0069

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society  
of America A, v4 n7 p1168-1175 Jul 87.

ABSTRACT: (U) Although an infinity of three-dimensional (3-D) objects could generate any given silhouette, we usually infer only one 3-D object from its two-dimensional (2-D) projection. What are the constraints that restrict this infinity of choices? We identify three mathematical properties of smooth surfaces plus one simple viewing constraint that seem to drive our preferred interpretation of 3-D shape from 2-D contour. The constraint is an extension of the notion of general position. Taken together, our interpretation rules predict that dents in a 3-D surface should never be inferred from a smooth 2-D silhouette. Keywords: Reprints. Image understanding, Shape recognition, Visual pattern recognition, Visual psychophysics, Vision algorithms.

DESCRIPTORS: (U) \*PATTERN RECOGNITION, \*SHAPE, \*SILHOUETTES, ALGORITHMS, MATHEMATICS, OPTICAL IMAGES, POSITION(LOCATION), PSYCHOPHYSICS, REPRINTS, THREE DIMENSIONAL, TWO DIMENSIONAL, VISION, VISUAL PERCEPTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

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UTAH UNIV SALT LAKE CITY

(U) DURIP FTIR Studies of Solid State Reaction Dynamics.

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-14 Nov 89.

JAN 90

PERSONAL AUTHORS: Wight, Charles A.

CONTRACT NO. AFOSR-89-0103

PROJECT NO. 3842

TASK NO. A2

MONITOR: AFOSR  
TR-90-0004

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The origin of metastability in high symmetry molecules was studied by photoionization and photodissociation techniques. We have studied one- and two-photon ionization processes in the Triatomic hydrogen molecule and photodissociation of H<sub>3</sub>. We have also observed photoionization of Diatomic Helium, Triatomic nitrogen, and D<sub>3</sub>O and performed a background study of metastable HD, H<sub>2</sub>, and He<sub>2</sub>. A new source for formation of H<sub>3</sub> and H<sub>5</sub> has been developed. Keywords: Photochlorination, Vapor deposition, Photolysis, Hydrocarbons, Solid solutions. (aw)

**DESCRIPTORS:** (U) \*PHOTODISSOCIATION, \*PHOTOIONIZATION, \*POLYATOMIC MOLECULES, \*REACTION KINETICS, BACKGROUND, DIATOMIC MOLECULES, DYNAMICS, HELIUM, HYDROCARBONS, HYDROGEN, IONIZATION, MOLECULES, PHOTOLYSIS, PHOTONS, SOLID SOLUTIONS, SOLID STATE PHYSICS, SOURCES, SYMMETRY, VAPOR DEPOSITION, SOLID STATE CHEMISTRY, NITROGEN, FOURIER SPECTROSCOPY, INFRARED SPECTROSCOPY.

**IDENTIFIERS:** (U) PE81104D, WJAFOSR3842A2, Photochlorination.

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EMORY UNIV ATLANTA GA DEPT OF CHEMISTRY

(U) Electronic Spectroscopy and Energy Transfer Pathways of Matrix Isolated Iodine.

JAN 90

PERSONAL AUTHORS: MacIer, Michel; Nicolai, Jean-Philippe; Heaven, Michael C.

CONTRACT NO. AFOSR-87-0197

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-90-0062

UNCLASSIFIED REPORT

**SUPPLEMENTARY NOTE:** Pub. in Jnl. of Chemical Physics, v91 n15 p674-682, 15 Jul 89.

**ABSTRACT:** (U) Visible laser excitation (460-725 nm) of dilute rare gas/Iodine (2000:1) matrices resulted in emission from the I<sub>2</sub>(A) state. Reanalysis of the A yields X spectra provided revised molecular constants for matrix isolated I<sub>2</sub>. A state lifetimes of 70 + or - 20.80 + or - 20, and 110 yields 30 microseconds were observed in Argon, Krypton and Xenon hosts, respectively. Excitation spectra for the A state closely followed the I<sub>2</sub> continuum absorption spectrum, indicating that transfer from the B and 1 pi states was effective in populating I<sub>2</sub>(A). At dilution ratios of 600:1 or lower the I<sub>2</sub>p(1/2)-2p(3/2) transition was observed in conjunction with the A-X bands. Excitation studies showed that isolated I atoms, trapped during the deposition process, were excited by energy transfer from nearby I<sub>2</sub> molecules. A vibronic progression, similar to the A-X bands, but shifted to longer wavelengths, was noted in concentrated Rg/I<sub>2</sub>(300:1) matrices. This system, which was emitted with a lifetime of about 10 ms, mostly probably originated from perturbed I<sub>2</sub>(A'). Intermolecular energy transfer was observed in matrices that contained I<sub>2</sub> codeposited with O<sub>2</sub>. Electronic excitation of I<sub>2</sub> resulted in a long-lived emission from O<sub>2</sub>(a). Matrices containing high concentrations of iodine also exhibited O<sub>2</sub>(a) yields

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I(2P1/2) transfer Reprints. (AW)

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND COGNITIVE SCIENCES

DESCRIPTORS: (U) \*IODINE, ARGON, ATOMS, CONCENTRATION(COMPOSITION), CONSTANTS, DEPOSITION, DILUTION, ELECTRONICS, EMISSION, ENERGY TRANSFER, EXCITATION, FREQUENCY, HIGH RATE, ISOLATION, KRYPTON, LASERS, LONG LIFE, MOLECULE MOLECULE INTERACTIONS, MOLECULES, RARE GASES, REPRINTS, SPECTRA, SPECTROSCOPY, TRANSFER, VISIBILITY, XENON.

(U) Parts of Recognition.

DESCRIPTIVE NOTE: Rept. for Jul 83-Sep 89,

OCT 89

PERSONAL AUTHORS: Richards, Whitman

CONTRACT NO. F49620-83-C-0135

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-90-0070

UNCLASSIFIED REPORT

ABSTRACT: (U) We propose that, for the task of object recognition, the visual system decomposes shapes into parts, that it does so using a rule defining part boundaries rather than part shapes, that the rule exploits a uniformity of nature-transversality, and that parts with their descriptions and spatial relations provide a first index into a memory of shapes. This rule allows an explanation of several visual illusions. We stress the role of inductive inference in our theory and conclude with a precis of unsolved problems. Keywords: Image understanding; Shape recognition; Visual pattern recognition; Visual psychophysics; Vision algorithms; Reprints. (sdw)

DESCRIPTORS: (U) \*PATTERN RECOGNITION, \*VISUAL PERCEPTION, ALGORITHMS, ILLUSIONS, INDEXES, MEMORY DEVICES, PARTS, PSYCHOPHYSICS, RECOGNITION, REPRINTS, SHAPE, SPATIAL DISTRIBUTION, VISION.

IDENTIFIERS: (U) PE61102F, WJAF0AR2313A5.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND  
COGNITIVE SCIENCES

Reprints. (SDW)  
DESCRIPTORS: (U) \*CURVATURE, \*IMAGE PROCESSING, \*VISUAL  
PERCEPTION, ALGORITHMS, BANDPASS FILTERS, CONTOURS,  
DISCRIMINATION, ELEVATION, EXTRACTION, GRAPHS, HIGH  
FREQUENCY, LOW PASS FILTERS, ORIENTATION(DIRECTION),  
PATTERN RECOGNITION, PROCESSING, PSYCHOPHYSICS,  
RANGE(DISTANCE), REPRINTS, STIMULI, TANGENTS, THRESHOLD  
EFFECTS, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

(U) Mechanisms of Contour Curvature Discrimination.

DESCRIPTIVE NOTE: Rept. for Jul 83-Sep 89,

JAN 89

PERSONAL AUTHORS: Richards, Whitman

CONTRACT NO. F49620-83-C-0135

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-80-0068

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society  
of America A, v6 p108-115 Jan 89.

ABSTRACT: (U) Visual processing of contour curvature was  
investigated by measuring increment thresholds for  
curvatures from 0.31 to 25.4 deg (-1). Curvature  
discrimination was assessed for three classes of stimuli:  
simple curved contours, high-frequency bandpass-filtered  
contours, and low-pass-filtered contours. High-frequency  
bandpass filtering had no effect on discrimination at low  
curvatures and only a modest effect at high curvatures.  
In contrast, low-pass filtering caused substantial  
threshold elevations at all curvatures. Thus the data  
lead to the surprising conclusion that high-spatial-  
frequency, orientation-selective mechanisms dominate  
curvature processing over the entire range of curvatures  
tested, a conclusion at odds with previous suggestions  
that large, low-spatial-frequency filters are involved in  
analyzing low curvatures. The data are explained  
accurately by a two-process model for curvature  
extraction: at high curvatures the local-processing model  
proposed by Wilson fits the data well, whereas at low  
curvatures orientations are compared at points displaced  
a fixed distance along the tangent to the curve. Keywords:  
Image understanding, Shape recognition, Visual pattern  
recognition, Visual psychophysics, Visual algorithms.

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NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND COGNITIVE SCIENCES

(U) Local Moduli of Continuity of Some Classes of Gaussian Processes.

(U) Encoding Contour Shape by Curvature Extrema.

89

DESCRIPTIVE NOTE: Rept. for Jul 83-Sep 89.

OCT 86

PERSONAL AUTHORS: Samorodnitsky, Gennady

PERSONAL AUTHORS: Richards, Whitman

CONTRACT NO. F49620-85-C-0144

CONTRACT NO. F49620-83-C-0135

PROJECT NO. 2304

PROJECT NO. 2313

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-90-0058

MONITOR: AFOSR  
TR-90-0071

UNCLASSIFIED REPORT

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ABSTRACT: (U) We study local behavior of sample paths of Gaussian process. The purpose is to find a connection between local sample moduli of a Gaussian process at a certain point of the parameter space and metric entropy of the set generated by the process in the corresponding Hilbert space. For certain classes of Gaussian processes, our results provide a unifying approach to finding local moduli of continuity. Keywords: Reprints. (KR)

DESCRIPTORS: (U) \*CONTINUITY, \*STATISTICAL PROCESSES, BEHAVIOR, ENTROPY, HILBERT SPACE, REPRINTS, PATHS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society of America, v3 p1483-1491 Sep 86.

ABSTRACT: (U) Curvature extrema provide significant information about the shape of an image contour, such as a silhouette, and are the basis for the Hoffman-Richards codon representation for shape. This representation based on curvature easily translates into a binary string that will describe the abstract shape of any smooth image curve. The computation of the basic shape primitive requires dealing with two ever-pervasive problems: contour noise and scale. We show how contour noise can be estimated given knowledge of the shape of the filter used to compute curvature from the edge list of the contour. To handle the scale problem, we use an adaptation of Witkin's scale space. Our algorithm differs from Witkin's by using a notion of parts to set criteria for significant structures. Keywords: Image processing; Image understanding; Shape recognition; Visual pattern recognition; Visual psychophysics; Vision algorithms; Reprints. (edc)

DESCRIPTORS: (U) \*CURVATURE, \*IMAGE PROCESSING, ALGORITHMS, CODING, CONTOURS, FILTERS, GRAPHS, IMAGES, NOISE, OPTICAL IMAGES, PARTS, PATTERN RECOGNITION, PSYCHOPHYSICS, REPRINTS, SCALE, SHAPE, SILHOUETTES,

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STRUCTURAL PROPERTIES, VISION, VISUAL PERCEPTION.

CALIFORNIA INST OF TECH PASADENA ARTHUR AMOS NOYES LAB  
OF CHEMICAL PHYSICS

IDENTIFIERS: (U) Hoffman Richards codon, Binary systems,  
PE01102F, WJAFQSR2313A5.

(U) Femtosecond Real-Time Probing of Reactions. 5. The  
Reaction of IHgI.

DEC 89

PERSONAL AUTHORS: Dantus, D.; Bowman, R. M.; Gruebele, M.;  
Zewail, A. H.

CONTRACT NO. AFOSR-87-0071

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-90-0107

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v91  
n12 p7437-7450, 15 Dec 89. See also Report 3, AD-A206 680.

ABSTRACT: (U) The dissociation reaction of Mercuric  
Iodide is examined experimentally using femtosecond  
transition-state spectroscopy (FTS). The reaction  
involves symmetric and antisymmetric coordinates and the  
transition-state is well-defined: IHgI yields (IHgI)  
Qs'Qa'(a)(++)\* yields Mercurous Iodide + I. FTS is  
developed for this class of ABA-type reactions and  
recurrences are observed for the vibrating fragments  
(symmetric coordinate) along the reaction coordinate  
(antisymmetric coordinate). The translational motion is  
also observed as a delay time of the free fragments.  
Analysis of our FTS results indicates that the reaction  
wave packet proceeds through two pathways, yielding  
either I(2P(3/2)) or I\* (2P(1/2)) as one of the final  
products. Dissociation into these two pathways leads to  
HgI fragments with different vibrational energy,  
resulting in distinct trajectories. Hence, oscillatory  
behaviors of different periods in the FTS transients are  
observed depending on the channel probed (approx. 300 fs  
to approx. 1 ps). These results are analyzed using the  
standard FTS description, and by classical trajectory  
calculations performed on model potentials which include  
the two degrees of freedom of the reaction. Quantum

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calculations of the expected fluorescence of the fragment are also performed and are in excellent agreement with experiments. Reprints. (aw)

DESCRIPTORS: (U) \*CHEMICAL DISSOCIATION, \*IODIDES, \*MERCURY COMPOUNDS, \*SPECTROSCOPY, COMPUTATIONS, COORDINATES, DELAY, ENERGY, FRAGMENTS, MODELS, OSCILLATION, QUANTUM STATISTICS, RESPONSE, SYMMETRY, REAL TIME, TRAJECTORIES, TRANSITIONS, VIBRATION, WAVE PACKETS, QUANTUM CHEMISTRY, FLUORESCENCE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, Femtosecond Transition State Spectroscopy, FTS(Femtosecond Transition State Spectroscopy).

STATE UNIV OF NEW YORK AT BUFFALO AMHERST  
(U) Gap States of Charges Solitons in Polyacetylene.

DEC 89

PERSONAL AUTHORS: Sun, Xin; Lu, Dingwei; Ru, Rouli; Li, X. S.; Lin, D. L.

CONTRACT NO. F49620-86-C-0009

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0110

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v40 n18  
p12446-12449, 15 Dec 89.

ABSTRACT: (U) By considering the electron interaction in polyacetylene, it is found that there exist two gap states in charged solitons of trans-polyacetylene; one is deep level, and the other is shallow level. The deep one shifts 0.23 eV down (for a positive soliton) or up (for a negative soliton) from the center of the gap, while the shallow one is 0.06 eV under the bottom edge of the conduction band (positive soliton) or above the top edge of the valence band (negative soliton). These results agree with the absorption spectra of trans-polyacetylene. Other shallow states outside the energy bands are also predicted. Reprints. (AW)

DESCRIPTORS: (U) \*POLYMERS, BOTTOM, CONDUCTION BANDS, EDGES, ELECTRONS, ENERGY BANDS, INTERACTIONS, REPRINTS, SHALLOW DEPTH.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

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STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Optical Nutation in Polymers Irradiated by Ultrashort Laser Pulses, IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

DEC 89

PERSONAL AUTHORS: Li, Xiao-shen; Lin, D. L.; George, Thomas F.; Sun, Xin

REPORT NO. 112

CONTRACT NO. F49620-86-C-0009

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-90-0109

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, V40 n17  
p728-732, 15 Dec 89.

ABSTRACT: (U) The transient behavior of the optical susceptibility of polydiacetylene induced by an ultrafast pump field is investigated. Within a two-level model which includes phonon effects phenomenologically, an analytical expression for the nonlinear susceptibility is obtained. In addition to spectral hole burning, the novel phenomenon of optical nutation is found. Both this nutation and the shape of the hole depend sensitively on the detuning between the exciton frequency and the sum of the pump field and the phonon mode frequencies. The electronic state and phonon-mediated optical Stark blue shift are also found in this model. The results are in qualitative agreement with experiments and indicate that the steady-state approximation is reliable only when the pulse of the pump field is longer than several exciton lifetimes. Reprints. (AW)

DESCRIPTORS: (U) \*POLYMERS, AGREEMENTS, ELECTROMAGNETIC SUSCEPTIBILITY, ELECTRONIC STATES, EXCITONS, FREQUENCY, HIGH RATE, LIFE SPAN(BIOLOGY), MODELS, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, PHONONS, PULSED LASERS, PUMPS, REPRINTS, SHORT PULSES, STEADY STATE, TRANSIENTS.

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AD-A217 683 CONTINUED

AD-A217 683 6/11 14/2  
MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

(U) DURIP - Upgrade of the Meridian ACAS-470 for  
Toxicological Research.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 89,

JAN 90

PERSONAL AUTHORS: Trosko, James E.

CONTRACT NO. AFOSR-89-0114

PROJECT NO. 3842

TASK NO. A4

MONITOR: AFOSR  
TR-90-0115

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All  
DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) This proposal was to have our current  
Meridian ACAS 570 laser cytometer upgraded with a 5 watt  
coherent laser, Olympus microscope with a CCD camera and  
video monitor, a mass data storage computer and dual  
detector system. This upgrade allowed us new dimensions  
of research potentials for studying mechanisms of  
chemical-induced toxicities in living cells, specifically  
enabling us to detect if chemicals caused toxicities by  
altering free Ca++ level, causing pH changes or induction  
of free radicals in single cells. During this year, we  
have pioneered the application of this new instrument in  
the demonstration that (a) heptachlor, a toxic pesticide/  
neurotoxicant, caused increased of free Ca++; (b) several  
cytotoxic chemicals could generate free radicals; and (c)  
oncogene products could be detected using fluorescent  
antibodies; and (d) UV-induced DNA damage could be  
quantified using fluorescent antibodies. Keywords:  
Laboratory equipment; Meridian ACAS-570; Laser image  
analyzer; Quantitative fluorescence detection; Mechanisms  
of chemical toxicities. (aw)

DESCRIPTORS: (U) \*CYTOTOXIN, \*LABORATORY EQUIPMENT,

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\*TOXICOLOGY, \*OPTICAL EQUIPMENT, ANALYZERS, ANTIBODIES,  
CELLS(BIOLOGY), CHEMICALS, COHERENCE, COMPUTERS, DATA  
STORAGE SYSTEMS, DETECTION, DETECTORS, FLUORESCENCE, FREE  
RADICALS, INDUCTION SYSTEMS, INSTRUMENTATION, LASERS,  
LIFE(BIOLOGY), MASS STORAGE, MONITORS, OPTICAL IMAGES,  
PESTICIDES, PH FACTOR, TOXICITY, VIDEO SIGNALS, CALCIUM,  
CATIONS, PH FACTOR, NEUROTOXINS, FLUORESCENT ANTIBODY  
TECHNIQUES, DEOXYRIBONUCLEIC ACIDS, RADIATION EFFECTS,  
LASER APPLICATIONS, GENES.

IDENTIFIERS: (U) PEG1104D, WUAFOSR3842A4, \*Laser  
Cytometers, Oncogenes, Heptachlor.



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 681 20/8 9/1 20/10 9/5

AD-A217 680 12/1

ARIZONA UNIV TUCSON

ILLINOIS UNIV AT URBANA DECISION AND CONTROL LAB

(U) Optical Bistability, 1988.

(U) Asymptotics in Time, Temperature and Size for Optimization by Simulated Annealing: Theory, Practice and Applications.

DESCRIPTIVE NOTE: Final technical rept. 1 Mar 88-30 Apr 89.

DESCRIPTIVE NOTE: Final technical rept. 15 May 88 - 14 May 89.

APR 89

PERSONAL AUTHORS: Peyghambarian,

JAN 90

CONTRACT NO. AFOSR-88-0128

PERSONAL AUTHORS: Kumar, P. R.; Rao, Vasant B.

PROJECT NO. 2305

CONTRACT NO. AFOSR-88-0181

TASK NO. B1

PROJECT NO. 2304

MONITOR: AFOSR  
TR-90-0073

TASK NO. A8

MONITOR: AFOSR

TR-90-0063

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at the Optical Bistability Topical Meeting, Aussois, France 23-25 Mar 88.

ABSTRACT: (U) Photonics; Optical bistability; Instabilities and chaos; Poster session 1: Nonlinear guided waves; Poster session 2: Instabilities and chaos; Poster session 3: Optical nonlinearities; Semiconductor nonlinearities; Optical switching and computing; Semiconductor switching and bistability; Poster session 1: Transverse Effects; Poster session 2: Optical bistability and switching dynamics; Poster session 3: Post deadline papers; Quantum confined nonlinearities; Nonlinear guided waves; Fundamental properties of systems with strong light-matter interactions. Symposia. (rrh)

DESCRIPTORS: (U) \*LIGHT, \*NONLINEAR SYSTEMS, \*OPTICAL PROPERTIES, \*OPTICAL SWITCHING, \*QUANTUM THEORY, \*SEMICONDUCTORS, CONFINEMENT(GENERAL), DYNAMICS, GUIDANCE, INTERACTIONS, MATERIALS, SWITCHING, SYMPOSIA, TRANSVERSE, WAVEFORMS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2305B1.

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ABSTRACT: (U) This project was concerned with simulated annealing, a Monte Carlo method for obtaining globally optimal or nearly globally optimal solutions to a variety of optimization problems. Results were obtained in two main areas: 1) Characterizing the cooling rate necessary and sufficient for simulated annealing to hit the global minimum and ii) obtaining an upperbound for the time-constant of convergence of simulated annealing at a fixed temperature to its equilibrium distribution and studying the growth of this bound as the temperature approaches zero asymptotically. (JD)

DESCRIPTORS: (U) \*SIMULATION, ANNEALING, COOLING, MONTE CARLO METHOD, OPTIMIZATION, RATES, SOLUTIONS(GENERAL), TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A8.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A217 678

20/5

PRINCETON UNIV NJ DEPT OF CHEMISTRY

GEORGIA INST OF TECH ATLANTA SCHOOL OF PHYSICS

(U) Mechanisms of Reactive Etching.

DESCRIPTIVE NOTE: Final technical rept. 1 May 85-30 Jun 89,

DEC 89

SEP 89

PERSONAL AUTHORS: Bernasek, Steven L.

PERSONAL AUTHORS: Flannery, M. R.

CONTRACT NO. AFOSR-85-0209G

REPORT NO. GIT-85-019

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0233

TASK NO. A2

PROJECT NO. 2301

MONITOR: AFOSR  
TR-90-0122

TASK NO. A4

MONITOR: AFOSR  
TR-90-0121

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This research project addressed several aspects of the surface chemistry of electronic materials. COF2 was shown to be an effective thermal and photochemical etchant of Si and SiO2. A general purpose molecular beam scattering apparatus was constructed to investigate the mechanism of COF2 etching of Si. H2 and CH4 scattering from the FE (111) surface was studied in order to characterize the operation of this system. Dynamics of van der Waals bound clusters interacting with solid surfaces were investigated. Deposition of metallic layers from organometallic precursors was also studied. Silicon; Silicon dioxide; Carbonyl fluoride; Etching; Clusters; Thin films. (edc)

DESCRIPTORS: (U) \*ETCHING, CARBONYL COMPOUNDS, DEPOSITION, DYNAMICS, ELECTRONICS, ELECTROMAGNETIC SCATTERING, FLUORIDES, HYDROGEN, LAYERS, MATERIALS, METALS, METHANE, MOLECULAR BEAMS, ORGANOMETALLIC COMPOUNDS, PRECURSORS, REACTIVITIES, SILICON, SILICON DIOXIDE, SOLID BODIES, SURFACE CHEMISTRY, SURFACES THIN FILMS.

IDENTIFIERS: (U) Carbonyl fluoride, PE61102F, WUAFOSR2303A2.

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ABSTRACT: (U) A list of publications of the research performed during the period 7/1/84 - 7/30/89 of the Grant AFOSR - 84-0233 is provided. Theoretical research has been conducted on (a) Termolecular Association and Recombination (b) electron- (excited) atom collisions and on (c) analytical solutions of the Time-Dependent Debye-Smoluchowske equation for transport influenced reactions. Papers on all of the above topics have been written up and published as papers, with reprints sent to AFOSR at various times during the period. The exact Master Equation Method, a Variational Principle discovered during the course of this research, and various approximate treatments are presented in Special Highlights of this research. In addition, the Appendixes include a major review of Recombination Process in General. Keywords: Recombination; Master equation; Variational principle; Diffusional method; Bottleneck method; Strong-collision; Coupled nearest-neighbor; Radiative; Dissociative. (kt)

DESCRIPTORS: (U) \*GASES, \*RECOMBINATION REACTIONS, \*MOLECULE MOLECULE INTERACTIONS, ATOMS, COLLISIONS, ELECTRONS, EQUATIONS, REPRINTS, SOLUTIONS(GENERAL), VARIATIONAL PRINCIPLES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 678 CONTINUED

AD-A217 597 21/2

WAYNE STATE UNIV DETROIT MI

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A4.

(U) Afterburning Suppression Kinetics in Rocket Exhaust.

DESCRIPTIVE NOTE: Final rept. 1 Jan-30 Jun 83,

JUN 83

PERSONAL AUTHORS: Singh, Trilochan

CONTRACT NO. AFOSR-83-0164

PROJECT NO. 2308

TASK NO. D9

MONITOR: AFOSR  
TR-89-1857

UNCLASSIFIED REPORT

ABSTRACT: (U) The exhaust gases from the nozzle of a rocket motor usually contain significant proportions of unburned fuel. This fuel mixes turbulently with ambient air as the exhaust jet expands and may burn causing a substantial elevation of temperature in the exhaust plume. The secondary combustion is affected by factors such as velocity and altitude of the missile, motor thrust level, pressure, temperature at the nozzle exit plane. The addition of certain species such as HBR, K2SO4 etc. have been observed to inhibit the afterburning process. The inhibition of afterburning process is of great significance to the Air Force. However, the kinetic mechanism for the afterburning suppression is not understood. A research program has been initiated at the Rocket Propulsion Laboratory to investigate the afterburning suppression kinetics by Dr. Jay Eversole. The fundamental research objective will be to determine the chemical reaction mechanisms that are critical to this afterburning suppression phenomena. Keywords: Combustion inhibition. (kt)

DESCRIPTORS: (U) \*AFTERBURNING, \*COMBUSTION, \*ROCKET EXHAUST, \*SUPPRESSION, AIR, AIR FORCE, ALTITUDE, CHEMICAL REACTIONS, ELEVATION, EXHAUST GASES, EXHAUST PLUMES, EXITS, FUELS, GUIDED MISSILES, INHIBITION, KINETICS, MOTORS, NOZZLES, ROCKET ENGINES, ROCKET LABORATORIES, ROCKET PROPULSION, SECONDARY, TEMPERATURE, THRUST.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2308D9.

PRINCETON UNIV NJ DEPT OF ELECTRICAL ENGINEERING AND  
COMPUTER SCIENCE

(U) Programmable CTD Filtering Using Coefficients 0, +1,  
and -1+.

79

PERSONAL AUTHORS: Bateman, Mark R.; Liu, Bede

CONTRACT NO. AFOSR-76-3083

MONITOR: AFOSR  
TR-90-0037

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the IEEE, p134-  
136 1980.

ABSTRACT: (U) In a previous paper a simple filtering  
scheme based on delta-modulation and using only  
coefficients 0, +1, and -1 was presented. In the present  
reprint those results are extended to highpass and  
bandpass filters and various techniques are presented to  
improve the performance of these filters. Examples are  
provided. (JHD)

DESCRIPTORS: (U) \*BANDPASS FILTERS, \*DELTA MODULATION,  
REPRINTS, CHARGE TRANSFER.

IDENTIFIERS: (U) Programmable Filters.

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

MARYLAND UNIV BALTIMORE COUNTY CATONSVILLE DEPT OF  
MATHEMATICS

(U) Chemical Synthesis at the Boundary between Polymer  
Chemistry and Inorganic Materials,

(U) Nonlinear Systems of Partial Differential Equations.

DESCRIPTIVE NOTE: Final rept. 25 Apr 87-24 Sep 89,

FEB 90

SEP 89

PERSONAL AUTHORS: Allcock, Harry R.

PERSONAL AUTHORS: Seidman, Thomas I.

REPORT NO. TR-51

CONTRACT NO. N00014-84-K-0447, AFOSR-89-0234

CONTRACT NO. N00014-84-K-0447, AFOSR-89-0234

MONITOR: AFOSR, ARO  
TR-90-0249, 25280.9-CH

PROJECT NO. 2304

TASK NO. A9

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-90-0117

SUPPLEMENTARY NOTE: Pub. in The Chemist, p10-18 Jan 90.  
Sponsored in part by contract DAAL03-88-K-0112.

UNCLASSIFIED REPORT

ABSTRACT: (U) A review about inorganic organic  
macromolecular systems based on a backbone of alternating  
phosphorus and nitrogen atoms, with two organic or  
organometallic groups attached to each phosphorus.  
Keywords: Reprints; Polyphosphazenes; Phosphazenes;  
Synthesis chemistry; Review. (AW)

ABSTRACT: (U) We list in the bibliography here some 40  
items: research papers associated with work during the  
grant period--including some items which represent the  
continuation of work initiated during that period. These  
have been listed in roughly the order in which the work  
was done, although many of the projects overlap in timing  
so it is difficult to fix any precise order. From the  
viewpoint of the grant, the most significant  
accomplishments have been, of course, those specifically  
related to systems of nonlinear partial differential  
equations with a particular emphasis on semiconductor  
device models. These are discussed at some length in the  
next two sections. We also note that in addition the  
Principal Investigator has been involved in a  
considerable variety of other mathematical activity--  
especially the work on switching systems, supported by  
the National Science Foundation. (kr)

DESCRIPTORS: (U) \*INORGANIC MATERIALS, \*MACROMOLECULES,  
\*ORGANIC MATERIALS, \*SYNTHESIS(CHEMISTRY), ATOMS,  
CHEMISTRY, NITROGEN, ORGANIC RADICALS, ORGANOMETALLIC  
COMPOUNDS, PHOSPHAZENE, PHOSPHORUS, POLYMERS, REPRINTS.

IDENTIFIERS: (U) Polyphosphazenes, Polymer chemistry.

DESCRIPTORS: (U) \*BIBLIOGRAPHIES, \*NONLINEAR SYSTEMS,  
\*PARTIAL DIFFERENTIAL EQUATIONS, MODELS, NONLINEAR  
DIFFERENTIAL EQUATIONS, OVERLAP, PRECISION, SEMICONDUCTOR  
DEVICES, SWITCHING.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A9.

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AD-A217 580 12/5

AD-A217 579 7/4 20/2

GENERAL RESEARCH CORP SANTA BARBARA CA

NORTHEASTERN UNIV BOSTON MA DEPT OF PHYSICS

(U) An Automated Program Testing Methodology and Its Implementation.

(U) Superlattice Effects in Graphite Intercalation Compounds.

DESCRIPTIVE NOTE: Preliminary draft.

DESCRIPTIVE NOTE: Rept. for 1 Oct 84-31 Mar 85,

OCT 80

APR 85

PERSONAL AUTHORS: Benson, J. P.; Andrews, D. M.

PERSONAL AUTHORS: Markiewicz, R. S.

REPORT NO. GRC-IM-2315

CONTRACT NO. F49620-82-C-0078

CONTRACT NO. F49620-79-C-0115

PROJECT NO. 2306

MONITOR: AFOSR  
TR-90-0147

TASK NO. C3

MONITOR: AFOSR  
TR-90-0142

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Challenges for the 80's include the need to make software less labor intensive and the need for automated programming tools. The testing phase is one area where there are automated tools which subject software to static tests, but few tools exist which automate the process of testing a program dynamically. Unlike hardware testing where a test pattern may be automatically stepped through and the test results evaluated by comparison with a 'gold unit', software has had no similar testing capability. We are just concluding research directed toward rectifying this lack by combining an existing automated test case generation and evaluation technique with the use of executable assertions to provide a means of automatically assessing the test results. Since the violations of assertions can act as a common denominator to any application, this method may be applied to any test object. This method goes one step farther even than the traditional hardware testing methods, because it also has the capability to automatically generate new test cases by perturbing the input values in accordance with an automated 'intelligent' evaluation of the past performance of a sequence of inputs. (edc)

DESCRIPTORS: (U) \*AUTOMATION, \*COMPUTER PROGRAMMING, COMPUTER PROGRAMS, DYNAMIC TESTS, INPUT, METHODOLOGY, TEST AND EVALUATION, TEST METHODS, TOOLS.

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ABSTRACT: (U) A new kind of two-dimensional, field-induced phase transition has been discovered in diatomic bromine graphite intercalation compounds. Similar to, but much more pronounced than Condon domain formation in three-dimensions, it is a Landau level instability which results in two types of domains having different numbers of Landau levels occupied. Study of the dynamics of this phase has revealed a number of domain wall resonances, and strong sensitivity to pinning, with hysteresis observed in some samples. Analysis of the resonance suggests that the resistivity in the domain phase is considerably lower than in the normal phase -- possible confirmation of a theory that these domains are associated with a type of quantum Hall effect. In Arsenic penta fluoride-graphite, which displays a field-induced phase transition, x-ray studies reveal a variety of zero-field phase transitions including one which appears to be incommensurate along the c-axis. Keywords: Solitons. (AW)

DESCRIPTORS: (U) \*CRYSTAL LATTICES, \*GRAPHITE, \*PHASE TRANSFORMATIONS, \*BROMINE, DOMAIN WALLS, DYNAMICS, HALL EFFECT, HYSTERESIS, LAYERS, QUANTUM THEORY, RESISTANCE, RESONANCE, DIATOMIC MOLECULES, ARSENIC COMPOUNDS, FLUORIDES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306C3, \*Intercalation

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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Compounds, Solitons, Arsenic Pentafluoride,  
\*Superlattices.

COLORADO STATE UNIV FORT COLLINS DEPT OF MECHANICAL  
ENGINEERING

(U) Structure of Model Gas Flames in Nitramines.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 88-30 Nov  
89,

DEC 89

PERSONAL AUTHORS: Branch, Melvyn C.

CONTRACT NO. AFOSR-88-0331

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-90-0116

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this paper is to summarize the current status of studies we have undertaken of model gas phase flames associated with the combustion of nitramine based solid rocket propellants. These studies consist of measurements of the structure of stable and unstable species concentration profiles and temperature in laminar, premixed, flat flames of fuel Nitrogen Oxide mixtures at low pressure. The experimental measurements are then compared to calculations of the concentration profiles using a one dimensional flame code which models the transport processes and chemistry of the flame. The transport processes include species diffusion and thermal conduction through the flame and the chemistry is modeled by a detailed chemical kinetic reaction mechanism. The flames which have been studied thus far are supplied with Methane, CH<sub>2</sub>O or CO as fuel and NO<sub>2</sub>, N<sub>2</sub>O or O<sub>2</sub> as oxidizer. The overall characteristics of the flames are presented in the paper and the preliminary conclusions of the flame modeling are discussed. Keywords: Formaldehyde; Carbon monoxide; Nitrogen dioxide; Nitrous oxide; Oxygen; Diagnosis general. (aw)

DESCRIPTORS: (U) \*COMBUSTION, \*FLAMES, \*NITRAMINES,  
CARBON MONOXIDE, CHEMICAL REACTIONS, CODING,  
DIAGNOSIS(GENERAL), DIFFUSION, EXPERIMENTAL DATA, FUELS,

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GASES, LAMINAR FLOW, LOW PRESSURE, MEASUREMENT, METHANE, MIXING, MIXTURES, MATHEMATICAL MODELS, NITROGEN DIOXIDE, NITROGEN OXIDES, NITROUS OXIDE, ONE DIMENSIONAL, OXIDIZERS, OXYGEN, REACTION KINETICS, SOLID ROCKET PROPELLANTS, THERMAL CONDUCTIVITY, TRANSPORT PROPERTIES, VAPOR PHASES.

MINNESOTA UNIV MINNEAPOLIS

(U) Structure from Motion.

DESCRIPTIVE NOTE: Final rept. 1 Apr-30 Sep 88.

NOV 88

IDENTIFIERS: (U) PE61102F, WJAFOSR2308A1.

PERSONAL AUTHORS: Thompson, William B.

CONTRACT NO. AFOSR-87-0168

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-90-0006

UNCLASSIFIED REPORT

ABSTRACT: (U) Analysis of surface boundaries has been extended to situations in which a camera is able to actively track environmental surface points. Two problems were examined - the determination of relative depth at a boundary and the determination of the direction of motion. In both cases, the ability to actively track significantly decreases the complexity of the computations required. An analysis of the computational basis for the visual detection of moving objects has been completed. We have shown that moving object detection can exploit one or more of three general approaches. Each has particular strengths and weakness. Two significant results have been obtained in the area of motion-based segmentation. The first combines motion and contrast information in a boundary detection method that is both more reliable and more accurate than possible using only motion or only contrast. The integration is done in a manner involving little additional computation. Secondly, we have shown how motion information can be used to reduce ambiguity in the recognition of partially occluded objects. Keywords: Robotics; Image understanding; Time-varying image analysis, Visual motion; Optical flow; Segmentation; Computer vision; Artificial intelligence; Space perception. (AW)

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*OPTICAL DETECTION, \*IMAGE PROCESSING, \*MOTION, AMBIGUITY,

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BOUNDARIES, COMPREHENSION, COMPUTATIONS, COMPUTER APPLICATIONS, CONTRAST, DEPTH, DETERMINATION, FLOW, MOVING TARGETS, OPTICAL IMAGES, OPTICAL PROPERTIES, OPTICAL TRACKING, PATTERN RECOGNITION, ROBOTICS, SEGMENTED, SPACE PERCEPTION, STRUCTURAL PROPERTIES, SURFACES, TIME, VARIATIONS, VISUAL PERCEPTION.

AD-A217 576 12/9

STANFORD UNIV CA DEPT OF COMPUTER SCIENCE

(U) Intelligent Real-Time Problem Solving: Conceptual Analysis of Issues, Ideas and Results.

DESCRIPTIVE NOTE: Final rept. 1 Aug-31 Oct 89,

IDENTIFIERS: (U) Computer vision, PE61102F,  
WUAFOSR2304A7.

DEC 89

PERSONAL AUTHORS: Shoham, Yoav; Hayes-Roth, Barbara

CONTRACT NO. F49620-89-C-0103

PROJECT NO. 5581

TASK NO. A7

MONITOR: AFOSR  
TR-90-0064

UNCLASSIFIED REPORT

ABSTRACT: (U) Our final report consists of four parts. The first two address the issues as defined by the Air Force in the call for proposals, and as discussed in the kickoff meeting. In the first document, authored by Yoav Shoham and Barbara Hayes-Roth, we propose a neutral framework in which to define the terms and issues involved in IRTPS, and make specific recommendations regarding subsequent stages of the project. The second document, authored by Stanley Rosenschein, Barbara Hayes-Roth and Lee Erman, proposes a similar neutral framework. We then describe our approach to controlling processes intelligently, centered around the notion of agents. In a document authored by Yoav Shoham a general approach to so-called agent-oriented programming is outlined, and in the fourth document, authored by Barbara Hayes-Roth, intelligent real-time agents are discussed in more detail. (rrh)

DESCRIPTORS: (U) \*PROBLEM SOLVING, \*REAL TIME, AIR FORCE, DOCUMENTS.

IDENTIFIERS: (U) WUAFOSR5581A7, PE62702F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A217 507 CONTINUED

RAYTHEON CO PORTSMOUTH RI SUBMARINE SIGNAL DIV

(U) Experimental Testing of Corpuscular Radiation Detectors. Volume 2. Revision 1.

IDENTIFIERS: (U) PE82714E, PE62702E, WUAFOSR526102, WUAFOSR526103, PN5261, TAO4.

DESCRIPTIVE NOTE: Final rept. 1 Nov 87-31 Jan 89,

SEP 89

PERSONAL AUTHORS: Grossi, Mario D.

REPORT NO. CN-RA-0084-REV-1

CONTRACT NO. F49620-87-C-0050, \$\$DARPA Order-5271

PROJECT NO. 5261, 5261

TASK NO. 02, 03

MONITOR: AFOSR  
TR-89-1675-VOL-2-REV-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 1, AD-A217 506.

ABSTRACT: (U) Observations were performed by using Prof. Joe Weber's torsion balance, a room-temperature instrument that was constructed by University of Maryland under a subcontract from Raytheon, and was installed at LANL in Summer 1988. The torsion balance was mounted at a fixed location, close to the edge of a rotating table (1 RPM rotational speed) that Raytheon had constructed and moved to Los Alamos, NM. As the table rotated, the tritium-filled container (neutrino source) and the deuterium-filled container (that provided a 'newtonian force' reference) were sensed by the instrument. At the time of writing of this Report, the results of the measurements are not fully conclusive. A six-month contract extension, expected to last until 31 December 1989, will provide the final answer whether or not we could observe repulsion forces, attributable to neutrino pressure, with the torsion balance. (enk)

DESCRIPTORS: (U) \*CORPUSCULAR RADIATION, BALANCE, CONTRACTS, DETECTORS, EDGES, INSTRUMENTATION, NEUTRINOS, POSITION(LOCATION), PRESSURE, ROOM TEMPERATURE, ROTATION, SOURCES, TABLES(DATA), TIME, TORSION, VELOCITY, WRITING.

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RAYTHEON CO PORTSMOUTH RI SUBMARINE SIGNAL DIV

TABLES(DATA), TIME, TORSION, VELOCITY, WRITING.

(U) Experimental Testing of Corpuscular Radiation Detectors. Volume 1. Revision 1.

IDENTIFIERS: (U) PE62714E, PE62702E, WUAFOSR526102, WUAFOSR526103, PN5261, TA04.

DESCRIPTIVE NOTE: Final rept. 1 Nov 87-31 Jan 89.

SEP 89

PERSONAL AUTHORS: Grossi, Mario D.

REPORT NO. CN-RA-0063-REV-1

CONTRACT NO. F49620-87-C-0050, \$\$DARPA Order-5271

PROJECT NO. 5261, 5261

TASK NO. 02, 03

MONITOR: AFOSR  
TR-89-1675-VOL-1-REV-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also Volume 2, AD-A217 507.

ABSTRACT: (U) Observations were performed by using Prof. Joe Weber's torsion balance, a room-temperature instrument that was constructed by University of Maryland under a subcontract from Raytheon, and was installed at LANL in Summer 1988. The torsion balance was mounted at a fixed location, close to the edge of a rotating table (1 RPM rotational speed) that Raytheon had constructed and moved to Los Alamos, NM. As the table rotated, the tritium-filled container (neutrino source) and the deuterium filled container (that provided a Newtonian force reference) were sensed by the instrument. At the time of writing this report, the results of the measurements are not fully conclusive. A six-month contract extension, expected to last until 31 December 1989, will provide the final answer whether or not we could observe repulsion forces, attributable to neutrino pressure, with the torsion balance. (emk)

DESCRIPTORS: (U) \*NEUTRINOS, BALANCE, CONTAINERS, CONTRACTS, CORPUSCULAR RADIATION, DETECTORS, DEUTERIUM, EDGES, FILLING, INSTRUMENTATION, POSITION(LOCATION), PRESSURE, ROOM TEMPERATURE, ROTATION, SOURCES,

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CALIFORNIA UNIV DAVIS DEPT OF MATHEMATICS

EQUATIONS, LINEAR SYSTEMS, LINEARITY, MATHEMATICAL MODELS,  
SERIES(MATHEMATICS), SOLUTIONS(GENERAL), SYNTHESIS.

(U) Observer Based Compensators for Nonlinear Systems.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 86-31 Mar  
89,

MAR 89

PERSONAL AUTHORS: Krener, Arthur J.

CONTRACT NO. AFOSR-85-0267

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-1689

UNCLASSIFIED REPORT

ABSTRACT: (U) The report develops a new method for obtaining higher degree linear approximations of a certain class of nonlinear control systems. The standard approach in the analysis and synthesis of nonlinear systems is a first order approximation by a linear model. The report seeks an approximation for a nonlinear system by a linear model up to higher degrees than one. This is achieved by finding an appropriate nonlinear coordinate transformation-nonlinear feedback pair to perform the higher degree linearization. With the proposed method, one can improve the accuracy of the approximation up to arbitrarily higher degrees, provided certain solvability conditions are satisfied. The Hunt-Su linearizability theorem makes these conditions precise. Our approach to the solution of this linearization problem is similar to Poincare's Normal Form Theorem in formulation, but different in its solution method. The Homological Equations are based on the goal of obtaining a model accurate to a higher degree in the series expansion. A solution to this system of linear equations is equivalent to the solution of the problem of linearization up to higher degrees by coordinate change and feedback. (jhd)

DESCRIPTORS: (U) \*COMPENSATORS, \*NONLINEAR SYSTEMS,  
\*CONTROL THEORY, ACCURACY, APPROXIMATION(MATHEMATICS),  
CONTROL SYSTEMS, COORDINATES, EXPANSION, LINEAR ALGEBRAIC

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OAK RIDGE NATIONAL LAB TN

(U) Communication Results for Parallel Sparse Cholesky Factorization on a Hypercube.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A3, \*Cholesky factorization, hypercubes.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 87.

89

PERSONAL AUTHORS: George, Alan; Liu, Joseph W.; Ng, Esmond

CONTRACT NO. DE-AC05-84OR21400, \$AFOSR-ISSA-88-00012

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-87-1343

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub...in Parallel Computing, v10 p287-298 1989.

ABSTRACT: (U) We consider the problem of reducing data traffic among processor nodes during the parallel factorization of a sparse matrix on a hypercube multiprocessor. A task assignment strategy based on the structure of an elimination tree is presented. This assignment is aimed at achieving load balancing among the processors and also reducing the amount of processor-to-processor data communication. An analysis of regular grid problems is presented, providing a bound on communication volume generated by the new strategy and showing that the allocation scheme is optimal in the asymptotic sense. Some experimental results on the performance of this scheme are presented. Keywords: Reprints; Parallel computation; Linear algebra sparse linear systems; Cholesky factorization. (KR)

DESCRIPTORS: (U) \*MULTIPROCESSORS, \*COMMUNICATIONS TRAFFIC, \*DATA REDUCTION, ALLOCATIONS, COMMUNICATION AND RADIO SYSTEMS, COMPUTATIONS, ELIMINATION, GRIDS, NODES, PARALLEL ORIENTATION, PROCESSING EQUIPMENT, REPRINTS, SPARSE MATRIX, STRATEGY, TRAFFIC, TREES, VOLUME, LINEAR ALGEBRA.

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CARNEGIE-MELLON UNIV PITTSBURGH PA

VIRGINIA UNIV CHARLOTTESVILLE SCHOOL OF MEDICINE

(U) Multiple Ignition, Combustion and Quenching of Hydrocarbon Fuel Sprays.

(U) Direct Assessment of Synaptic Modification Rules.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 81-30 Jun 82,

DESCRIPTIVE NOTE: Final rept. 1 Jun-31 Dec 84,

DEC 82

JAN 84

PERSONAL AUTHORS: Aggarwal, Bishop R.; Sirignano, W. A.; Sommer, H. T.

PERSONAL AUTHORS: Levy, William B.

CONTRACT NO. AFOSR-80-0203

CONTRACT NO. AFOSR-83-0236

PROJECT NO. 2308

MONITOR: AFOSR  
TR-89-1847

TASK NO. A2

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-1852

UNCLASSIFIED REPORT

ABSTRACT: (U) Ignition data has been compiled for combustible gaseous mixtures with hot burning particle sources. High-speed photography, Schlieren photography and pyrometry have been employed in the diagnostics. The ignition and non-ignition domains in terms of particle size and mixture ratio have been determined. The design and fabrication of the spray ignition experiment is underway. Finite-difference and asymptotic results have been concluded and the ignition domains have been determined with good agreement (within our limitations of knowledge about chemical kinetics) have been obtained. The preliminary theoretical results about spray ignition indicated that minimum ignition energy and ignition delay should be treated as probabilistic parameters.

DESCRIPTORS: (U) \*COMBUSTION, \*FUEL SPRAYS, \*IGNITION, \*QUENCHING, \*REACTION KINETICS, ENERGY, GASES, HIGH SPEED PHOTOGRAPHY, HIGH TEMPERATURE, HYDROCARBONS, IGNITION LAG, MIXTURES, PARAMETERS, PARTICLE SIZE, PARTICLES, SCHLIEREN PHOTOGRAPHY, PROBABILITY, PYROMETERS, RATIOS, DIAGNOSIS(GENERAL).

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A2.

AD-A217 198

ABSTRACT: (U) We have spent considerable time reprogramming our computer programs for data acquisition and evaluation. This is an important effort since we were previously unable to study simultaneously the synaptic response and the cell discharge. This improvement has become particularly critical since the ongoing evaluation of data gathered last year shows strong support for the existence of two distinct adaptive processes. One process modifies the synaptic response, and another adaptive process modifies the conversion of synaptic current into cell firing. Note that this improvement in data gathering is an on-going task. We are continuing our study (i.e., data gathering and evaluation) of the quantitative manner in which asymptotic changes are induced independently at neighboring synapses. This study has at least two important implications. First, it corroborates our earlier claims that we are studying a process of individual synaptic modification. Second, it helps to establish the experimental conditions which allow us to distinguish a variety of adaptive modification processes. Finally, we have continued our theoretical work which considers various interpretations of the adaptive processes we have experimentally observed. The context of this interpretation now centers on optimally performing, adaptive pattern recognition systems. We are encouraged by the performance shown by multiplicative, recursive neural networks. (kt)

DESCRIPTORS: (U) \*NERVE TRANSMISSION, \*DATA ACQUISITION, \*NEURAL NETS, \*SYNAPSE, ADAPTIVE SYSTEMS, CELLS, COMPUTER PROGRAMMING, COMPUTER PROGRAMS, CONVERSION, MODIFICATION, PROGRAMMING, COMPUTER PROGRAMS, CONVERSION, MODIFICATION,

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MULTIPLICATION FACTOR, PATTERN RECOGNITION, RECURSIVE  
FUNCTIONS, RESPONSE(BIOLOGY), THEORY, TIME.

MASSACHUSETTS UNIV AMHERST

(U) Image Understanding by Adaptive Networks of Goal  
Seeking Neurons.

IDENTIFIERS: (U) PEG1102F.

DESCRIPTIVE NOTE: Rept. for 1 May-24 Nov 84.

FEB 85

PERSONAL AUTHORS: Spine111, D. N.

CONTRACT NO. AFOSR-83-0207

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-1846

UNCLASSIFIED REPORT

ABSTRACT: (U) We interfaced a two-dimensional (2-D) digitizing tablet to one of the serial ports and wrote suitable programs to allow digitization and inputting of brain sections to the computer and disk. Each brain was stained with horseradish peroxidase (HRP) and consisted of about 150 sections. We also wrote programs to allow the computer to generate three-dimensional reconstructions of each brain (3-D). The SUN workstation software package called SUNCORE allows us to view brains reconstructed in 3-D from any point of view and perspective. That is, on the color monitor we can rotate, translate, and scale on any of the x, y, z axes the reconstructed brain in minutes. These newly acquired capabilities allow us to evidence cortical and subcortical regions that feed information to the areas we analyze with microelectrodes to study the functional responses of single neurons. At this writing we have reconstructed three brains. A first impression is that numerous cortical areas send terminals to a recording site; that is, there seem to be substantive interconnections between somato-sensory, Claire-Bishop, insular, and visual 1, 2, 3. We have not done any recordings or HRP injections in the insular cortex areas 18 and 19. All our recordings were from somato-sensory, area 17, and Claire-Bishop in the cortex. Subcortically we recorded only from the hypothalamus. In all these

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regions we found adaptation to varying degrees. Keywords:  
Brain function. (kt)

NORTHWESTERN UNIV EVANSTON IL CRESAP NEUROSCIENCE LAB

DESCRIPTORS: (U) \*NEURAL NETS, \*BRAIN, \*IMAGE PROCESSING,  
ADAPTIVE SYSTEMS, BRAIN, CIRCUIT INTERCONNECTIONS, COLORS,  
COMPUTER PROGRAMS, CONDIMENTS, ELECTRODES, FEEDING,  
HOMING, HYPOTHALAMUS, INJECTION, INJECTIONS(MEDICINE),  
ANATOMICAL MODELS, MONITORS, NERVE CELLS, NETWORKS,  
PEROXIDASES, RECORDING SYSTEMS, RESPONSE, SITES, STATIONS,  
SUN, WORK.

(U) Phosphoprotein Regulation of Synaptic Reactivity:  
Enhancement and Control of a Molecular Gating  
Mechanism.

DESCRIPTIVE NOTE: Rept. for 20 Mar-2 Apr 85,

APR 85

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

PERSONAL AUTHORS: Routtenberg, Aryeh

CONTRACT NO. AFOSR-83-0335

PROJECT NO. 2312

TASK NO. A3

MONITOR: AFOSR  
TR-89-1845

UNCLASSIFIED REPORT

ABSTRACT: (U) Significant Accomplishments and Research Progress includes: 1) Fatty acid regulators of protein kinase C. We have demonstrated that the regulation of synaptic reactivity is closely associated with phosphorylation of protein F1 and that this phosphorylation depends on the activation of protein kinase C. 2) Endogenous protein inhibitor of protein kinase C. As briefly mentioned in the Progress Report we have discovered an endogenous inhibitor of protein kinase C. 3) Exogenous micro-iontophoretic application of protein kinase C regulators. These experiments have just recently been initiated. In this report I shall describe the techniques used and the rationale for the protocols instituted. 4) Acquisition and Construction of Major Research Equipment. On December 15, 1984 a VAX 11/750 was installed in this laboratory. (kt)

DESCRIPTORS: (U) \*PHOSPHOPROTEINS, \*NERVE TRANSMISSION,  
\*NERVE IMPULSES, \*SYNAPSES, ACQUISITION, ACTIVATION,  
FATTY ACIDS, PHOSPHORYLATION, REACTIVITIES, REGULATIONS,  
REGULATORS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A3, Phosphoprotein  
Regulation.

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RADIOIANA PARIS (FRANCE)

PARIS-6 UNIV (FRANCE) LAB D'OPTIQUE DES SOLIDES

(U) Magnitude Anomalies and Propagation of Local Phases.

(U) Relationships between Electronic Structure and Stability of Metallic Glasses.

DESCRIPTIVE NOTE: Final rept. 1 Dec 81-30 Nov 82,

DESCRIPTIVE NOTE: Final rept. 30 Sep 80-30 Sep 81,

JAN 83

MAY 82

PERSONAL AUTHORS: Bouchon, M.; Cansl, Y.; Massinon, B.; Mechler, P.; Ravalau, N.

PERSONAL AUTHORS: Abeles, F.; Theye, M. L.; Nguyen Van, V.

CONTRACT NO. AFOSR-80-0082

CONTRACT NO. AFOSR-78-3701

PROJECT NO. 3291

PROJECT NO. 2306

TASK NO. 32

TASK NO. B2

MONITOR: AFOSR  
TR-89-1748MONITOR: AFOSR  
TR-89-1749

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The report describes a study of magnitude anomalies in French Polynesia. A first approach gives an anomaly per station which is roughly a function of azimuth valid for all French Polynesia plus a station's constant. A more detailed study shows the influence of local structure. Next, a theoretical study of generation and propagation of crustal seismic waves, radial and vertical displacement are computed up to 500 km for various sources (earthquakes and explosions). The last section discusses propagation of T waves and conversion into seismic waves at a continental slope level. We explain the rather long duration of T phases in continental station (some minutes, in French Polynesia only some 10 seconds) by conversion of water waves to seismic waves along a large area of the continental slope. This was verified experimentally. Seismic wave magnitude; Seismic data anomalies.

DESCRIPTORS: (U) \*ANOMALIES, \*POLYNESIA, \*SEISMIC DATA, \*SEISMIC WAVES, \*CONTINENTAL SLOPES, \*DISPLACEMENT, \*EARTH CRUST, \*EARTHQUAKES, \*EXPLOSIONS, \*LONG RANGE(TIME), \*PHASE, \*PROPAGATION, \*SEISMOLOGICAL STATIONS, \*VERTICAL ORIENTATION, \*WATER WAVES, \*WAVE PROPAGATION.

IDENTIFIERS: (U) PE81101E, WUAFOSR329132, \*French Polynesia.

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ABSTRACT: (U) This year has been dedicated to thorough investigations of the electronic properties of amorphous metallic Ag-Ge alloys. These alloys are similar to the Au-Ge alloys studied previously, but in Ag the d-band is located at lower energies with respect to the Fermi level than in Au. The hybridization between the Ge s,p-states and the noble metal d-state may therefore occur differently; moreover, this extends the energy range over which the free-electron behavior of the optical properties can be studied. Amorphous metallic Ag-Ge alloys have been obtained by co-evaporation onto cold substrates for Ge concentrations ranging from 20 to 40 at. %. We have controlled their stability as a function of temperature and we have followed the crystallization processes by in-situ resistance measurements. We have determined their transport properties and we have analyzed their optical properties according to the free-electron Drude model. We discuss the variation of the conduction electron parameters with composition and we compare the results with those already obtained for the Au-Ge alloys. (rrh)

DESCRIPTORS: (U) \*ALLOYS, \*AMORPHOUS MATERIALS, \*ELECTRICAL CONDUCTIVITY, \*GLASS, \*OPTICAL PROPERTIES, \*SUBSTRATES, \*TRANSPORT PROPERTIES, \*BEHAVIOR, \*CRYSTALLIZATION, \*ELECTRONICS, \*ELECTRONS, \*ENERGY, \*FERMI

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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SURFACES, FREE ELECTRONS, HYBRIDIZATION, LOW ENERGY, LOW  
TEMPERATURE, MEASUREMENT, PARAMETERS, RESISTANCE,  
STABILITY.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
CHEMISTRY

(U) Instrumentation Purchased.

IDENTIFIERS: (U) PE-61102F, WJAFOSR2306B2.

DESCRIPTIVE NOTE: Final rept.,

AUG 84

PERSONAL AUTHORS: Weber, William P.

MONITOR: AFOSR  
TR-89-1615

UNCLASSIFIED REPORT

ABSTRACT: (U) The instrument purchased was a routine  
Fourier transform nuclear magnetic resonance spectrometer  
for use by graduate students, research associates and  
faculty at the University of Southern California. The  
instrument is a JEOL (USA) Inc. Model JNM/FX-900 equipped  
with a dual 1H/13C omni probe and includes a micro insert.  
In September 1983, the instrument was received and was  
fully installed and meeting specifications by October  
1983. Since installation the equipment has operated  
continuously and has had virtually no downtime. Usage of  
the instrument has developed to more than 100 hours per  
week and is now on a scheduled usage basis. (AW)

DESCRIPTORS: (U) \*SPECTROMETERS, CALIFORNIA, STUDENTS.  
UNIVERSITIES.

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OKLAHOMA STATE UNIV STILLWATER DEPT OF ZOOLOGY

(U) Interaction of Hydrophobic Molecules with Heme Proteins.

DESCRIPTIVE NOTE: Rept. for 1 Aug 84-31 Jul 85.

FEB 85

PERSONAL AUTHORS: Harmon, H. J.

CONTRACT NO. AFOSR-84-0284

PROJECT NO. 2J12

TASK NO. A5

MONITOR: AFOSR  
TR-89-1841

UNCLASSIFIED REPORT

ABSTRACT: (U) We have been measuring the Km and Vmax parameters of cytochrome oxidase in intact mitochondria in the presence and absence of lidocaine, tetracaine, and procaine anesthetics. Data suggests that cytochrome oxidase is not as sensitive to these compounds as is succinate oxidation. Early findings in intact mitochondria indicate that tetracaine and procaine, but not dibucaine or lidocaine, cause shifts in the 604 nm alpha band of cytochrome oxidase. Also, dibucaine, tetracaine, and lidocaine cause 20-30 mV increases in apparent midpoint of the oxidase in mitochondria. We have not yet studied isolated oxidase. We have done two types of experiments on myoglobin. The first investigates changes in the protein by anesthetics. Thus far, procaine, tetracaine, and dibucaine have not caused noticeable changes at 5 mM concentration. Lidocaine, however, causes a significant change in the 3.7 ppm resonance. The second type of experiment assays changes in the anesthetic due to interaction with myoglobin. No changes were observed with procaine, but dramatic changes were observed with lidocaine with less prominent changes in dibucaine and tetracaine. Cytochrome c has resonances at g=3 and g=2.2 that we are studying. No compound alters the position of g=2.2, but all narrowed the half-bandwidth (narrowed the signal) without an increase in peak height; in other words, a change in microwave extinction coefficient is

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not observed. (kt)

DESCRIPTORS: (U) \*MOLECULE MOLECULE INTERACTIONS  
\*HEMOGLOBIN, \*HYDROPHOBIC PROPERTIES, \*PROTEINS, ALPHA  
SPECTRA, ANESTHETICS, ASSAYING, BLOOD PROTEINS,  
COEFFICIENTS, CYTOCHROME OXIDASE, EXTINCTION, HEIGHT,  
INTERACTIONS, LOCAL ANESTHETICS, MICROWAVES, MITOCHONDRIA,  
MOLECULES, MYOGLOBULIN, OXIDATION, PEAK VALUES,  
SUCCINATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

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SEARCH CONTROL NO. EVJ20M

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AD-A217 062 12/1

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

COLORADO UNIV AT BOULDER DEPT OF COMPUTER SCIENCE

(U) Logarithmic Transformations and Stochastic Control.

(U) Parallel Methods for Solving Nonlinear Block Bordered Systems of Equations.

DESCRIPTIVE NOTE: Technical rept..

DESCRIPTIVE NOTE: Technical rept. 1 Sep 88-31 Dec 89.

APR 82

DEC 89

PERSONAL AUTHORS: Fleming, Wendell H.

PERSONAL AUTHORS: Zhang, Xiaodong; Byrd, Richard H.; Schnabel, Robert B.

CONTRACT NO. AFOSR-81-0116, \$NSF-MCS79-03554

PROJECT NO. 2304

REPORT NO. CU-CS-454-89

TASK NO. A4

CONTRACT NO. DAAL03-88-K-0086, \$AFOSR-85-0251

MONITOR: AFOSR  
TR-89-1782

MONITOR: ARD, AFOSR  
24923.7-MA, TR-90-0434

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) We are concerned with a class of problems described in a somewhat imprecise way as follows. Consider a linear operator of the form  $L + V(x)$ , where  $L$  is the generator of a Markov process  $x$  sub  $t$  and the potential  $V(x)$  is some real-valued function on the state space sigma of  $x$  sub  $t$ . We are interested in probabilistic representations for solutions  $\phi(s, x)$  to a certain backward equation with data  $\phi(T, x) = \phi(x)$  at a final time  $T$ . (kr)

DESCRIPTORS: (U) \*LOGARITHM FUNCTIONS, \*STOCHASTIC CONTROL, \*TRANSFORMATIONS(MATHEMATICS), LINEARITY, MARKOV PROCESSES, OPERATORS(MATHEMATICS), PROBABILITY, TIME.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A4.

AD-A217 097

DESCRIPTORS: (U) \*NONLINEAR ALGEBRAIC EQUATIONS, \*PARALLEL PROCESSING, ALGORITHMS, CIRCUIT ANALYSIS, CONVERGENCE, MATHEMATICAL ANALYSIS, MODIFICATION.

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SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-CDA84-20944.

ABSTRACT: (U) A group of parallel algorithms, and their implementation is discussed, for solving a special class of large sparse nonlinear equations. The type of sparsity occurring in these problems, which arise in VLSI design, structural engineering and many other areas, is called a block bordered structure. An explicit method and several implicit methods are described for solving block bordered nonlinear problems, and a mathematical analysis and computational comparisons are made for the two types of methods. Several variations and globally convergent modifications of the implicit method are also presented. Parallel algorithms for solving block bordered nonlinear equations are described and experimental results presented on the Intel hypercube that show the effectiveness of the parallel implicit algorithms. These experiments include a fairly large circuit simulation that leads to a multi-level block bordered system of nonlinear equations. Keywords: Nonlinear equations; Block bordered; Parallel; Implicit methods; Circuit simulation. (jhd)

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NONLINEAR SYSTEMS, STRUCTURAL ENGINEERING.

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

IDENTIFIERS: (U) VLSI(Very Large Scale Integration),  
Block Bordered Systems.

(U) Effective Behavior of Composite and Nonlinear Media.

DESCRIPTIVE NOTE: Final rept. Dec 84-Dec 87,

JUL 88

PERSONAL AUTHORS: Caf11sch, Russel E.

CONTRACT NO. AFOSR-85-0017

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-89-1701

UNCLASSIFIED REPORT

ABSTRACT: (U) Systems with composite or nonlinear structure are of great importance to current science and technology. Under this grant, we have investigated several such system: nonlinear optical media, fluids with vortex motion, rarified gases and composite elastic or electrostatic materials. Our research goals have been to derive mathematical theories or models for these systems, to develop numerical algorithms and compute solutions for the resulting equations, and to mathematically analyze the equations. For example, for systems with microscopic variation, such as a composite elastic material or a rarified gas, we derived theories that describe the systems on a macroscopic scale. For nonlinear systems with singularities, such as nonlinear optics or vortex dynamics, we find simple descriptions of the development of the singularities and performed numerical solutions with singularities to verify the simpler theories. (kr)

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*RESEARCH MANAGEMENT, \*RAREFIED GASES, \*ELECTROSTATICS, ALGORITHMS, BEHAVIOR, ELASTIC PROPERTIES, EQUATIONS, FLUIDS, MATERIALS, MATHEMATICS, MEDIA, MICROSCOPY, MOTION, NONLINEAR SYSTEMS, NUMERICAL ANALYSIS, OPTICAL MATERIALS, OPTICS, SOLUTIONS(GENERAL), THEORY, VARIATIONS, VORTICES.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

SMITH-KETTLEWELL EYE RESEARCH FOUNDATION SAN FRANCISCO  
CA

(U) Synthesis and Structure of the First Example of a  
Borazinylcyclotriphosphazene,

89

PERSONAL AUTHORS: Welker, Mark F.; Manners, Ian; Parvez,  
Masood; Allcock, Harry R.

CONTRACT NO. AFOSR-89-0234

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-1880

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society,  
Chemical Communications, v13 p871-872 1989.

ABSTRACT: (U) Cyclic and high polymeric phosphazenes are known with a wide variety of organic, inorganic, and organometallic side groups. However, to the best of our knowledge, no examples of phosphazenes with borazinyl side groups have been reported. Species of this type are of considerable interest both as possible polymerization 'monomers' and as pyrolytic precursors to novel non-oxide ceramic materials. The first example of a borazinyl-phosphazene, gem-n3P3 (NMe2)4(NH-B3N3Me5)2, has been prepared and its structure determined by single crystal X-ray diffraction. Keywords: Phosphazenes; Borazine; X-ray structure; Synthesis; Chemistry. Reprints. (EDC)

DESCRIPTORS: (U) \*PHOSPHAZENE, \*POLYMERIZATION, \*POLYMERS, AZINES, BORON COMPOUNDS, CERAMIC MATERIALS, CYCLIC COMPOUNDS, MOLECULAR STRUCTURE, MONOMERS, ORGANOMETALLIC COMPOUNDS, PRECURSORS, PYROLYSIS, REPRINTS, SIDES, SINGLE CRYSTALS, SYNTHESIS(CHEMISTRY), X RAY DIFFRACTION, X RAYS.

IDENTIFIERS: (U) Borazinyls, Nonoxide ceramic materials, Side chains, Phosphazene/Borazinylcyclotri, Triphosphazenes, PE61102F, WUAFOSR23J3B2.

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UNCLASSIFIED REPORT

ABSTRACT: (U) We have investigated a number of paradigms where odd targets have to be either detected or discriminated and where set size, prior knowledge of target identity, and other factors were varied. We have set up an eye movement monitoring experiment to use the speed and accuracy of saccades to supplement the psychophysical observations described above. We have been examining the phenomenon of color (or brightness) spreading, developing a paradigm to show that the filling of color could be interrupted by using an after-coming patterned mask. We are also making neutral models to account for the psychophysical observations as they emerge. Keywords: Visual cortex; Eye movements.

DESCRIPTORS: (U) \*PSYCHOPHYSICS, \*VISUAL CORTEX, COLORS, EYE MOVEMENTS, FILLING, MODELS, MONITORING, NEUTRAL, PSYCHOLOGY, SIZES(DIMENSIONS).

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

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AD-A217 019 CONTINUED

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

Disilabenzenes, Polysilastyrene, Tetramesityldisilene,  
Phenylacetylene, Disilacyclobutene.

(U) Chemical Reactions and Properties of Organosilicon  
Compounds Related to New Materials.

DESCRIPTIVE NOTE: Final rept. 1 Feb 82-31 Dec 82,

DEC 82

PERSONAL AUTHORS: West, Robert

CONTRACT NO. AFOSR-82-0067

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1708

UNCLASSIFIED REPORT

ABSTRACT: (U) In this report, research on four major aspects of our general program will be summarized: 1) Disilene Chemistry; 2) Disilabenzene; 3) polysilastyrene and other Silane-High Polymers; 4) Cyclic Polysilanes. During the period covered by this report, a number of chemical reactions of tetramesityldisilene have been carried out. The compound behaves like an olefin in some reactions, for instance addition of hydrogen halides or chlorine. It will also undergo cycloaddition with phenylacetylene to the corresponding disilacyclobutene. However other reactions are unprecedented for olefins, for instance the addition of alcohols and ketones to the Si-Si double bond. Hexamethyl-1,4-disilabenzene was obtained by thermolysis or photolysis. The synthesis of polysilastyrene has been systematically studied, and some of the variables in the process are now understood. (AW)

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*ORGANIC COMPOUNDS, \*SILICON COMPOUNDS, ADDITION REACTIONS, ALCOHOLS, CHEMICAL BONDS, CHEMISTRY, CHLORINE, CYCLES, CYCLIC COMPOUNDS, HYDROGEN COMPOUNDS, KETONES, PHOTOLYSIS, POLYSILANES, SYNTHESIS(CHEMISTRY), BENZENE, STYRENES, HALIDES, ACETYLENES, PHENYL RADICALS, CYCLOBUTENES, PYROLYSIS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B1, Diselenes,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A217 018 6/4 12/5

AD-A217 017 6/2 6/11

MARINE BIOLOGICAL LAB WOODS HOLE MA

GEORGETOWN UNIV WASHINGTON DC SCHOOL OF MEDICINE

(U) Training in Methods in Computational Neuroscience.

(U) The Key Involvement of Poly (ADP-Ribosylation) in Defense against Toxic Agents in Molecular Biology Studies.

DESCRIPTIVE NOTE: Final rept. 1 Sep-1 Nov 89,

NOV 89

DESCRIPTIVE NOTE: Annual rept. Nov 88-Nov 89,

PERSONAL AUTHORS: Halvorson, Harlyn O.

NOV 89 15P

CONTRACT NO. AFOSR-89-0436

PERSONAL AUTHORS: Smulson, Mark E.

PROJECT NO. 2313

CONTRACT NO. AFOSR-89-0053

TASK NO. A8

PROJECT NO. 2312

MONITOR: AFOSR  
TR-89-1704

TASK NO. A5

MONITOR: AFOSR  
TR-89-1693

UNCLASSIFIED REPORT

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ABSTRACT: (U) This four week course was offered for the second time at the Marine Biological Laboratory in Woods Hole, MA. Twenty students were selected from a pool of 52 highly qualified applicants. Students who were prepared in both computer science and neuroscience were selected because they could benefit immediately from the high level discussion without much additional training in either discipline. The course had two lectures per day plus a laboratory wherein students worked with GENESIS, the simulation software developed at Caltech. Once familiar with GENESIS, students undertook a simulation project. The reports of this project are attached. Keywords: Neurology courses education; Neurophysiology computer program; Teaching methods. (edc)

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*NEUROLOGY, \*NEUROPHYSIOLOGY, COMPUTATIONS, COMPUTER PROGRAMS, COURSES/EDUCATION), LECTURES, MARINE BIOLOGY, STUDENTS, TEACHING METHODS.

IDENTIFIERS: (U) Genesis computer program, PE61102F, WUAFOSR2313A8.

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AD-A217 017

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ABSTRACT: (U) The program has 3 interrelated aims. The first stage involves recombinant construction of polymerase cDNA into a family of selected expression vectors which in most cases will possess an inducible promoter. During the first year, the cDNA was inserted in both sense and antisense orientations and also site-directed mutants. We were also concerned with construction (I-D) and expression of site-directed mutants and potential inhibitory peptides in vivo in order to eventually modulate the activity of poly(ADP-Rib) polymerase in cells, upon induction during DNA repair. Various expression vectors will be stably transfected into eukaryotic cells generally by co-transfection with a selectable gene. We expect various levels of overexpression and underexpression of poly(ADP-Rib) polymerase. In the case of the site-directed mutants and the inhibitory peptides (IID), we anticipate cells with reduced capacity for ADP-ribosylation. Biochemical and molecular biological characterizations of the gene products of the various transfected cells are proposed prior to cytotoxicity or DNA repair analysis. These will include: Southern analysis to confirm integrated copies of the cDNA; both Northern and primer extension analysis of cellular mRNA to confirm that upon induction actual expression of the foreign gene occurs; and



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immunoprecipitation of poly(ADP-Rib) polymerase in vivo after induction. Mutagenicity. (edc)

CONNECTICUT UNIV STORRS DEPT OF COMMUNICATION SCIENCES  
(U) Auditory Perception.

DESCRIPTORS: (U) \*DEOXYRIBONUCLEIC ACIDS, \*MOLECULAR BIOLOGY, ADENOSINE PHOSPHATES, FOREIGN, GENES, IMMUNOASSAY, INHIBITION, MUTAGENS, MUTATIONS, PEPTIDES, PRECIPITATION, PROTECTION, REDUCTION, REPAIR, RIBONUCLEIC ACIDS, TOXIC AGENTS.

DESCRIPTIVE NOTE: Annual technical rept. 1 Nov 88-31 Sep 89.

NOV 89

IDENTIFIERS: (U) CDNA, Polymerases, Mutagenicity, Ribosylation, Recombinant polymerase cDNA, Cytotoxicity, Transfection, PE81102F, WUAFOSR2312A5.

PERSONAL AUTHORS: Cohen, Marlon F.

CONTRACT NO. AFOSR-89-0008

PROJECT NO. 2313

TASK NO. A6

MONITOR: AFOSR  
TR-89-1674

UNCLASSIFIED REPORT

ABSTRACT: (U) During the past year we have conducted several experiments designed to study those stimulus characteristics which contribute to the ability of the auditory system to separate simultaneous signals. We have studied the effects of synchronous amplitude modulation, specifically the influence of changes in relative level of two stimuli, and have found that by changing relative levels of the two stimuli involved, the ear can detect temporal synchrony over a range of at least four octaves. We have also studied the effects of simultaneous gating, synchronous FM, and harmonicity on the ability of the auditory system to detect a signal in the presence of other stimuli. We have found that each of these characteristics contribute to signal separation. (aw)

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, AMPLITUDE MODULATION, EAR, HEARING, SEPARATION, AUDITORY SIGNALS, STIMULI, SYNCHRONISM, DISCRIMINATION, FREQUENCY MODULATION, HARMONICS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A8.

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AD-A216 937 1/2

MINNESOTA UNIV MINNEAPOLIS DEPT OF ASTRONOMY

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF ELECTRICAL ENGINEERING

(U) Characteristics of Cosmic Infrared Variable Sources.

(U) Practical Methods for Robust Multivariable Control.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 89.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jul 89.

SEP 89 52P

OCT 89

PERSONAL AUTHORS: Jones, Terry J.

PERSONAL AUTHORS: Safonov, Michael G.; Jonckheere, Edmond A.

CONTRACT NO. AFOSR-87-0011

PROJECT NO. 2311

CONTRACT NO. AFOSR-88-0282

TASK NO. A1

PROJECT NO. 2304

MONITOR: AFOSR  
TR-89-1699MONITOR: AFOSR  
TR-89-1700

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Results of infrared photometric observations of 63 AFGL sources over the past nine years are presented. Using these data together with previous measurements of these stars, we determine pulsation periods and mean photometric characteristics. These stars are found to lie midway between classical Mira variables and the Radio Luminous OH/IR stars in their period distribution and photometric properties. For the sample as a whole, there is no evidence for sudden or transient behavior such as a switch in pulsation mode. Rather, these stars show rapid, but continuous, evolution from shorter period Miras with weak mass loss to longer periods and larger mass loss rates. The carbon rich stars in our sample have the same period distribution as the oxygen rich stars. None of the carbon stars have periods as long as those of the very long period Radio Luminous OH/IR stars. (rrh)

DESCRIPTORS: (U) \*CARBON, \*INFRARED RADIATION, \*PHOTOMETRY, \*STARS, LOSSES, LOW STRENGTH, MEAN, RATES, TRANSIENTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1.

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ABSTRACT: (U) The design of supermaneuverable fighter aircraft, high-precision space-born optical tracking systems and transatmospheric hypervelocity vehicles will pose significant challenges to modern control system design theory. The theme of the research has been making modern control theory work. The product of the research has been theory, algorithms and software applicable to multivariable feedback control problems in which there are design constraints requiring robust attainment of stability and control performance objectives in the face of both structured and unstructured uncertainty. (JHD)

DESCRIPTORS: (U) \*FLIGHT CONTROL SYSTEMS, \*CONTROL THEORY, \*MULTIVARIATE ANALYSIS, ALGORITHMS, COMPUTER PROGRAMMING, FEEDBACK, HYPERSONIC VEHICLES, AIR SUPERIORITY FIGHTERS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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AD-A216 935 5/8 12/9

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

TEXAS UNIV MEDICAL SCHOOL AT HOUSTON DEPT OF PHYSIOLOGY AND CELL BIOLOGY

(U) Preparative Gel Permeation Chromatography.

(U) Analysis and Synthesis of Adaptive Neural Elements.

DESCRIPTIVE NOTE: Final rept. 15 Nov 88-14 Nov 89,

DESCRIPTIVE NOTE: Research progress rept. 1 Aug 84-30 Apr 85,

NOV 89

APR 85

PERSONAL AUTHORS: Weber, William P.

PERSONAL AUTHORS: Byrne, John H.

CONTRACT NO. AFOSR-89-0180

CONTRACT NO. AFOSR-84-0213

PROJECT NO. 3842

PROJECT NO. 2312

MONITOR: AFOSR  
A2

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-1844

ABSTRACT: (U) The necessary components for a preparative gel permeation chromatography system were purchased. The system was assembled and is operating properly. Keywords: Liquid chromatography instrumentation. (kr)

UNCLASSIFIED REPORT

ABSTRACT: (U) The report contains a manuscript of a review article on neural and molecular mechanisms underlying information storage and its implications for learning and memory. During the period between 01 August 1984 and 30 April 1985 progress on the proposal entitled Analysis and synthesis of adaptive neural networks has been in two major directions. First, we have performed experimental studies on the modulation of ionic conductance mechanisms in individual neurons that are believed to contribute to neuronal plasticity and learning. Second, we have begun to develop a single-cell neuronal model for associative learning and simulated the initial model on a digital computer. Keywords: Learning. Memory, Information storage, Artificial intelligence. (sdw)

DESCRIPTORS: (U) \*GEL PERMEATION CHROMATOGRAPHY, INSTRUMENTATION, LIQUID CHROMATOGRAPHY.

IDENTIFIERS: (U) PE61104D, WUAFOSR3842A2.

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*LEARNING, \*NEURAL NETS, \*MEMORY(PSYCHOLOGY), ADAPTIVE SYSTEMS, ASSOCIATIVE PROCESSING, CELLS(BIOLOGY), DATA STORAGE SYSTEMS, DIGITAL COMPUTERS, EXPERIMENTAL DATA, MODELS, MODULATION, MOLECULAR PROPERTIES, NERVE CELLS, NERVOUS SYSTEM, PLASTIC PROPERTIES, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 904 CONTINUED

GEORGE WASHINGTON UNIV MEDICAL CENTER WASHINGTON DC DEPT  
OF MEDICINE

TETRACHLORIDE, CARDIOVASCULAR SYSTEM, CATALASE, CELLS,  
CELLS(BIOLOGY), CHEMICALS, CHLORINATED HYDROCARBONS,  
CHLOROETHANES, DOSAGE, ENDOTHELIAL, IRON, LIPIDS,  
MANNITOL, MEMBRANES(BIOLOGY), MUSCLES, OXIDATION,  
PHYSIOLOGY, PRODUCTION, TOXICITY, TRICHLOROETHANES,  
TRICHLOROETHYLENE, VOLUME.

(U) Free Radical Mechanisms of Xenobiotic Mammalian  
Cytotoxicities.

DESCRIPTIVE NOTE: Annual rept. Nov 88-30 Nov 89,

NOV 89

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

PERSONAL AUTHORS: Dickens, Benjamin F.

CONTRACT NO. AFOSR-88-0016

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-1687

UNCLASSIFIED REPORT

ABSTRACT: (U) Our initial goal was to identify if free radical mechanisms are involved in the cytotoxicity of a number of IRP volume I and II chemicals. We found that a number of these agents act to enhance membrane lipid peroxidation in response to a standard dose of exogenous free radicals. Using chlorinated hydrocarbons (carbon tetrachloride, trichloroethylene, dichloroethylene, trichloroethane, dichloroethane) as a model for other IRP chemicals, we established conditions to measure lipid peroxidation in cultured smooth muscle and endothelial cells. These agents induced lipid peroxidation in the presences of physiological levels of iron in these vascular cells by a mechanism that doesn't require cytochrome P-450. Antiradical treatment with deferoxamine and Probuco (but not SOD, catalase, or mannitol) appear to reduce the toxicity of these agents. We have also detected the presences of free radicals in the cultured cells by ESR spin trapping following exposure to iron and chlorinated hydrocarbons. Although this free radical production does not appear to require biotransformation by cytochrome P-450, it is also not a result of spontaneous oxidation of the IRP chemicals. Keywords: Toxicity, Cytotoxin.

DESCRIPTORS: (U) \*CYTOTOXIN, \*FREE RADICALS, CARBON

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AD-A216 890 CONTINUED

AD-A216 890 24/4 6/11

NORTH TEXAS STATE UNIV DENTON DEPT OF BIOLOGICAL  
-SCIENCES

DESCRIPTORS: (U) \*WATER QUALITY, \*SEWAGE, CANADA,  
CHEMICALS, CHLORINE, EFFLUENTS, FIELD TESTS, FUELS,  
GRADIENTS, ICE, INDUSTRIES, NORTH(DIRECTION), PROTEINS,  
RESPONSE, RIVERS, SEDIMENTS, SITES, SOLVENTS, STREAMS,  
STRESSES, TEST AND EVALUATION, TOXICITY, VALIDATION,  
WATER.

(U) Evaluation of the Efficacy of the Stress Protein  
Response as a Biochemical Water Quality Biomonitoring  
Method.

DESCRIPTIVE NOTE: Annual rept. 1 Aug 88-1 Aug 89.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2312A4.

AUG 89

PERSONAL AUTHORS: Dickson, Kenneth L.; Dyer, Scott;  
Zimmerman, Earl

CONTRACT NO. AFOSR-88-0295

PROJECT NO. 2312

TASK NO. A4

MONITOR: AFOSR  
TR-89-1778

## UNCLASSIFIED REPORT

ABSTRACT: (U) Potential field validation sites were evaluated in June 1989. Soldier Creek, emanating from Tinker AFB, was selected because of its industrial/sewage effluent. Soldier Creek, emanating from Tinker AFB, was selected because of its industrial/sewage effluent. Soldier Creek is the largest tributary of Crutcho Creek, which empties into the North Canadian River. Twelve sites along the three water ways were evaluated. Water was collected from each site and transported on ice. Toxicity was determined by placing 90d fathead minnows into 1-gallon jars filled with 3L of sample water. Two sites immediately below Tinker AFB exhibited acute toxicity with total mortality occurring within 30 minutes of test initiation. However, all other sites, showed no toxicity. The free chlorine level was in the site immediately below Tinker AFB (site 1) at all other sites. Thus, a toxicity and chemical gradient was found in Soldier Creek. Sediment collected at four sites, closest to Tinker AFB, smelled of fuel and solvents. Sediment toxicity was evaluated by placing 90d fathead minnows into 1 gallon glass jars filled 600 ml of Soldier Creek sediment overlaid with 2400 ml of Soldier Creek water. No toxicity was seen in any of the stations. (SDW)

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AD-A216 860 5/2 12/7 12/5

AD-A216 859 9/1

UNIVERSITY OF SOUTHERN CALIFORNIA MARINA DEL REY  
INFORMATION SCIENCES INST

TENNESSEE STATE UNIV NASHVILLE DEPT OF ELECTRICAL  
ENGINEERING

(U) Progress in Research on Knowledge Delivery.

(U) Fault-Tolerant VLSI Design Assessments for Advanced  
Avionics Department. Literature Review. Phase 1.

DESCRIPTIVE NOTE: Final rept. 1 Feb 83-31 Jan 84.

DESCRIPTIVE NOTE: Final rept..

MAR 84

FEB 82

PERSONAL AUTHORS: Mann, William C.

PERSONAL AUTHORS: Devgan, Satinderpaul S.; Alexander,  
Robert A.

CONTRACT NO. F49820-79-C-0181

PROJECT NO. 2304

CONTRACT NO. F49660-80-C-0089

TASK NO. A7

MONITOR: AFOSR

TR-89-1631

MONITOR: AFOSR

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Research under the contract during this period resulted in the following papers. 'Two discourse generators', 'The Anatomy of a Systemic Choice', 'An overview of the Penman text generation system', 'An introduction to the Nigel text generation grammar', 'Nigel: A systemic Grammar for Text Generation', 'A demonstration of the Nigel text generation computer program', 'A grammar and a lexicon for a text-production system', and 'The systemic framework in text generation: Nigel.' Keywords: Computers; Computer languages. (AW)

DESCRIPTORS: (U) \*GRAMMARS, \*COMPUTER PROGRAMS, ANATOMY, COMPUTERS, PROGRAMMING LANGUAGES, VOCABULARY.

IDENTIFIERS: (U) PE61102F, WDAFOSR2304A7.

ABSTRACT: (U) With the advances in VLSI technology, it will be possible to fabricate chips with 100,000 to 500,000 gates per chip. Rather the technology to pack more and more elements on a chip has outpaced the collective knowledge for effective use of chip real estate. For example, it is virtually impossible to test high density microcircuits. This report reviews the existing literature on VLSI technology with regards to proposed methods to increase reliability and testability. One of the critical problems of high density microcircuits is the limited number of I/O pins. The present literature points out the two types of circuit additions that can improve circuit reliability. The report also provides a list of references for further study of Fault-Tolerant Computing. (KR)

DESCRIPTORS: (U) \*CIRCUIT TESTERS, \*MICROCIRCUITS, ADDITION, AVIONICS, CHIPS(ELECTRONICS), CIRCUITS, DOCUMENTS, FAULTS, HIGH DENSITY, LITERATURE SURVEYS, RELIABILITY(ELECTRONICS), FAULT TOLERANT COMPUTING, COMPUTER AIDED DESIGN, PINS, RELIABILITY, TEST AND EVALUATION, TOLERANCE.

IDENTIFIERS: (U) VLSI(Very Large Scale Integration).

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AD-A216 852 CONTINUED

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES GEOPHYSICS  
LAB

Reprints. (edc)

(U) Crustal and Upper Mantle Velocity and Q of Mainland  
China.

DESCRIPTORS: (U) \*EARTHQUAKES, \*SEISMIC WAVES,  
ATTENUATION, CHINA, CROSSINGS, DISPERSING, EARTH CRUST,  
EARTH MANTLE, GEOMETRY, HETEROGENEITY, INVERSION,  
MULTIMODE, OBSERVATORIES, PATHS, PLATEAUS, RAYLEIGH WAVES,  
RECEIVERS, REPRINTS, RESEARCH FACILITIES, SEISMIC DATA,  
SEISMOLOGICAL STATIONS, SOURCES, STRUCTURAL GEOLOGY,  
SURFACE WAVES, TECTONICS, VELOCITY.

DESCRIPTIVE NOTE: Final technical rept. 2 Jul 76-31 Oct  
80.

NOV 80

IDENTIFIERS: (U) Love waves, Aftershocks(Seismology),  
Seismic velocity, Upper mantle, Tibet plateau, PE62701E,  
WUAFOSR329121.

PERSONAL AUTHORS: Teng, Ta-Ligang

CONTRACT NO. F49620-76-C-0010, \$\$ARPA Order-3291

PROJECT NO. 3291

TASK NO. 21

MONITOR: AFOSR  
TR-89-1830

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research,  
v85 n7 p3829-3844, 10 Jul 80.

ABSTRACT: (U) Repeated surface wave group velocity  
measurements over the same paths were made by using large  
aftershocks of several great ( $M > 7$ ) earthquakes which  
recently occurred in China. Multiple-filter technique was  
applied to the properly rotated three-component digital  
data from Seismological Research Observatory stations, so  
that both Rayleigh and Love wave dispersion data were  
obtained over a number of paths crossing various tectonic  
provinces of China. In several cases, higher-mode data  
were also derived. An estimate of uncertainty of these  
dispersion data was obtained from the repeated  
measurements with identical source-receiver geometry. The  
generalized surface wave inversion technique was applied  
to these multimode dispersion data, and crustal and upper  
mantle structures were derived for various tectonic  
provinces of China. The results clearly demonstrate that  
the Chinese mainland is far from being laterally  
homogeneous, the lateral heterogeneities closely reflect  
the tectonic developments in the recent past. A  
particularly unusual crustal and upper mantle structure  
is found underlying the Tibet plateau. Seismic data;

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AD-A216 826 7/3

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF PHYSICS

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Gordon Research Conference on Atomic Physics.

(U) Synthesis and Molecular Structure of 1,4-Diphenyltetrazenido Complexes of Bis(Phosphine) Nickel, Palladium, and -Platinum,

DESCRIPTIVE NOTE: Final rept. 1 Jun 83-31 May 84,

MAY 84

88

PERSONAL AUTHORS: Kelly, Hugh

PERSONAL AUTHORS: Lee, Soon W.; Miller, Glenn A.; Campana, Charles F.; Trogler, William C.

CONTRACT NO. AFOSR-83-0180

CONTRACT NO. AFOSR-86-0027

PROJECT NO. 2301

PROJECT NO. 2303

TASK NO. A4

TASK NO. B2

MONITOR: AFOSR  
TR-89-1834

MONITOR: AFOSR  
TR-89-1873

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*ATOMIC STRUCTURE, SPIN STATES, HYDROGEN, HELIUM, ALIGNMENT, PARTICLE COLLISIONS, PHOTOIONIZATION, TRAPPING(CHARGED PARTICLES), MOLECULAR STATES, SYMPOSIA.

IDENTIFIERS: (U) WJAFOSR2301A4, PEG1102F.

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry. v27 p1215-1219 1988.

ABSTRACT: (U) Transition-metal tetraazadiene complexes have been synthesized by coupling reactions between either an organic azide (RN3) or a diazonium salt (RN2(+)) and a metal complex in a low oxidation state, because the free tetraazadiene ligands were unavailable. Since 1967 several transition-metal tetraazadiene complexes have been reported, including derivatives of Ni, Pt, Co, Ir, Rh, and Fe. The N4R2 ligand in these compounds is a flexible ligand that can be viewed as either a neutral four-electron sigma-donor (A) group or an anionic four-electron donor (B). In structurally characterized complexes with transition metals both bonding modes have been observed with either two or one short N-N bond in the ligand backbone. To develop the chemistry of metal tetraazadiene complexes, it would be desirable to have a general method for their syntheses. A dianionic reagent similar to B would be preferred since the preformed ligand could be incorporated into complexes by metathetical procedures. Herein we report the first such synthesis for a series of metal complexes, which defines periodic trends in the interaction between the N4R2 unit and a transition metal. Reprints. (AW)

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DESCRIPTORS: (U) \*METAL COMPLEXES, \*TETRAZENES,  
\*TRANSITION METALS, AZIDES, BONDING, CHEMICAL AGENTS,  
CHEMISTRY, COUPLING(INTERACTION), DIAZO COMPOUNDS,  
LIGANDS, MATERIAL FORMING, METALS, MOLECULAR STRUCTURE,  
NICKEL, OXIDATION, PALLADIUM, PATTERNS, PHOSPHINE,  
PLATINUM, REPRINTS, SALTS, SYNTHESIS.

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Generation of Mono- and Dianions of 1,4-Diphenyl-2-  
tetrazene by Nonoxidative N-N Bond Formation. A Novel  
Route to a 2-Tetrazene, a Silacyclotetrazene, and the  
Tetrazenide Complex (1,4-Diphenyltetrazenido)  
bis(Triethylphosphine)- Palladium,

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

87

PERSONAL AUTHORS: Lee, Soon W.; Miller, Glenn A.; Campana,  
Charles F.; Maciejewski, Mary L.; Trogler, William C.

CONTRACT NO. AFOSR-86-0027

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1874

UNCLASSIFIED REPORT

ABSTRACT: (U) Most methods for making N-N bonds use  
oxidizing conditions. For example, 2-tetrazenes are  
synthesized by oxidation of unsymmetrically disubstituted  
hydrazines. Carbanion reagents have proved useful for  
forming bonds between carbon and many elements. For  
example, Trost and Pearson prepared triazenes from the  
reaction between phenylthiomethylazides and aryl Grignard  
reagents. Analogous reactions between alkyl amide anions  
and toluenesulfonyl azide were earlier used to transfer  
the alkyl group of amide to the azide. The intermediate  
in this reaction was postulated to be a tetrazenide anion.  
The only known tetrazenide dianion  $\text{Li}_2\text{Me}_3\text{Si}(\text{NN}=\text{N})(\text{Me}_3\text{Si})$   
is not easily synthesized. This paper reports 9 synthesis  
of  $\text{Li}_2(\text{N}(\text{Ph})=\text{N}(\text{N}(\text{Ph}))_2)$  and its application to the  
synthesis of tetrazenes. Reprints. (aw)

DESCRIPTORS: (U) \*OXIDATION, \*SYNTHESIS(CHEMISTRY),  
\*TETRAZENES, ALKYL RADICALS, AMIDES, ANIONS, ARYL

RADICALS, BONDING, CARBON, GRIGNARD REAGENTS, HYDRAZINES,  
PALLADIUM, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

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AD-A216 824 7/3

AD-A216 824 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

PROPERTIES, STRUCTURES.

(U) Study of Third-Order Microscopic Optical Nonlinearities in Sequentially Built and Systematically Derivatized Structures. IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

89

PERSONAL AUTHORS: Zhao, Ming-Tang; Samoc, Marek; Singh, Bharu P.; Prasad, Paras N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1787

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n23 p7916-7920 1989.

ABSTRACT: (U) With a goal of understanding the structure-property relationship for third-order microscopic optical nonlinearity, we have investigated the nonlinearities of a number of sequentially built and systematically derivatized conjugated structures by using degenerate four-wave mixing. To examine the nature of effective conjugation, we have measured the third-order microscopic nonlinearities, gamma, for several para polyphenyls and compared the dependence on the number of repeat units with that observed in the alpha-thiophene oligomers. Our results show that while the limiting conjugation length in each conjugated series may be different, it becomes much shorter for polyphenyls than for polythiophenes. Systematically derivatized alpha-terthiophene structures have also been investigated. The substitution of a pyrrole or a benzene unit in the place of the central thiophene ring in the alpha-terthiophene structure reduces the gamma value. (rrh)

DESCRIPTORS: (U) \*BENZENE, \*MICROSCOPY, \*MOLECULAR STRUCTURE, \*NONLINEAR SYSTEMS, \*PHENYL RADICALS, \*POLYMERS, \*PYRROLES, \*RINGS, \*THIOPHENES, GAMMA RAYS, LENGTH, LIMITATIONS, OPTICAL PROPERTIES, PHYSICAL

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AD-A216 823 CONTINUED

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MECHANICAL  
ENGINEERING(U) Multiple Ignition, Combustion and Quenching of  
Hydrocarbon Fuel Sprays.

DESCRIPTIVE NOTE: Annual rept.,

DEC 81

PERSONAL AUTHORS: Aggarwal, S.; Bishop, R.; Sirignano, W.  
A.; Sommer, H. T.

CONTRACT NO. WAFOSR-80-0203

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-1854

UNCLASSIFIED REPORT

ABSTRACT: (U) The objectives were to modify the experimental apparatus so that aromatic fuels such as toluene could be included in the program. It was also intended to continue the theoretical analysis of the ignition of gaseous mixtures and to begin the study of the heterogeneous mixture ignition. In the experiments methane and propane air ignition by burning aluminum particles were studied. In this period of research it was of interest to study the ignition limits of mixtures of air with the vapor of a volatile liquid fuel. This information expanded the data base relevant to ignition of liquid fuel sprays by burning metal particles. Theoretical work on the ignition of gaseous mixtures was completed during this period. Both computational and analytical studies were made. Since delivery of the gas mixtures and vapor mixtures to the combustion chamber were fundamentally different, several modifications to the existing apparatus were made to meet the new objectives of the program. It was of interest to be able to obtain a direct measurement of the temperature of the burning particle. Therefore, the possibility of outfitting the experimental apparatus with an optical pyrometer was examined. (jhd)

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DESCRIPTORS: (U) \*AROMATIC COMPOUNDS, \*COMBUSTION, \*FUEL  
SPRAYS, \*IGNITION, \*QUENCHING, AIR, ALUMINUM, COMBUSTION  
CHAMBERS, COMPUTATIONS, DATA BASES, FUELS, GASES,  
HETEROGENEITY, HYDROCARBONS, LIMITATIONS, LIQUIDS,  
MEASUREMENT, METALS, METHANE, MIXTURES, OPTICAL  
PYROMETERS, PARTICLES, PROPANE, THEORY, TOLUENES, VAPORS,  
VOLATILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

AD-A216 822 12/2 20/11

AD-A216 821 9/3

GEORGIA INST OF TECH ATLANTA

CORNELL UNIV ITHACA NY

(U) Second Order Accurate Finite Difference Methods.

(U) Acquisition of Laser and Signal Processing Equipment.

DESCRIPTIVE NOTE: Final rept. 30 Jun 81-31 Jan 84,

DESCRIPTIVE NOTE: Final rept. Apr 83-Mar 84,

AUG 84

JAN 85

PERSONAL AUTHORS: Hanagud, S.

PERSONAL AUTHORS: Grant, E. R.; Houston, P. L.  
Wiesenfeld, J. R.

REPORT NO. GIT-E-16-821, GIT-E-16-611

CONTRACT NO. AFOSR-81-0224

CONTRACT NO. AFOSR-83-0279

PROJECT NO. 2307

MONITOR: AFOSR  
TR-89-1858

TASK NO. B1

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-89-1858

UNCLASSIFIED REPORT

ABSTRACT: (U) Existing second order accurate finite difference methods have been evaluated for application to finite deformation transient dynamic response problems in solids. A new second order accurate finite difference technique has been developed. This is a two-step technique that can be used with deformable Lagrangian meshes. The technique has been developed by using the concepts of contour differences and McCormack methods. The second order techniques have been applied to study many problems including dynamic poynting effect problems, interaction of stress waves and cracks, beams, with nonstructured masses and stiffened shells.

DESCRIPTORS: (U) \*FINITE DIFFERENCE THEORY, \*DYNAMIC RESPONSE, \*CRACKS, \*DEFORMATION, \*INTERACTIONS, \*LAGRANGIAN FUNCTIONS, \*MESH, \*SHELLS(\*STRUCTURAL FORMS), \*SOLIDS, \*STIFFENING, \*STRESS WAVES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307B1.

AD-A216 822

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ABSTRACT: (U) A four-wave mixing technique using magnesium vapor has been used to provide tunable radiation in the 140-160 nm region. Two photons from one of the excimer-pumped dye laser are used to populate the 350d level in Mg, while a second, tunable photon derived from the other excimer-pumped dye laser is used to stimulate Raman gain in the vacuum ultraviolet. We have recently used these techniques to study the photo-dissociations of glyoxal, as described in detail in the preprint, and of OCS, described briefly here. A KrCl excimer laser at 222-nm was used to dissociate OCS in a molecular beam, while our tunable vacuum ultraviolet laser was used to probe the CO and sulfur products by laser-induced fluorescence. The results show that both S(3P) and S(1D) are produced, that all of the CO is formed in its lowest vibrational level, and that the CO(v=0) rotational distribution is extremely inverted; the rotational levels have roughly a Gaussian distribution centered at J=57. (rrrh)

DESCRIPTORS: (U) \*LASER INDUCED FLUORESCENCE, \*MAGNESIUM, \*PHOTONS, \*RAMAN SPECTRA, \*SIGNAL PROCESSING, \*TUNABLE LASERS, \*ULTRAVIOLET LASERS, \*VAPORS, ACQUISITION, GAIN, LASERS, LEVEL(QUANTITY), MOLECULAR BEAMS, NORMAL DISTRIBUTION, PROCESSING EQUIPMENT, RADIATION, ROTATION, SULFUR, TUNING, VACUUM ULTRAVIOLET RADIATION, VIBRATION.

IDENTIFIERS: (U) PE61102F.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 820 8/11 8/3

AD-A216 819 6/11

SOUTHEASTERN LOUISIANA UNIV HAMMOND DEPT OF BIOLOGICAL SCIENCES

MICROBIOLOGICAL ASSOCIATES INC BETHESDA MD

(U) Ultrastructural and Cytochemical Evaluation of the Cytotoxicities of Trimethylpentane on Rat Renal and Hepatic Tissues.

(U) Mechanisms of Cellular Membrane Effects of TCDD, Selected Perfluorinated Acids and Polyhalogenated Aromatic Hydrocarbons.

DESCRIPTIVE NOTE: Progress rept. 1 Sep 84-31 Aug 85.

DESCRIPTIVE NOTE: Forecast rept.,

APR 85

FEB 85

PERSONAL AUTHORS: Norton, William N.

PERSONAL AUTHORS: Rogers-Back, Andrea

CONTRACT NO. AFOSR-84-0310

CONTRACT NO. F49620-84-C-0074

PROJECT NO. 2312

PROJECT NO. 2312

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR TR-89-1859

MONITOR: AFOSR TR-89-1860

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary objective of the present investigation is to determine the acute cytopathological effects of trimethyl-pentane on the hepatic and renal tissues of the sexually mature male rat. Specifically, the first year of the project is designed to evaluate, cytochemically, the activity of lysosomes associated with kidney cells of the proximal convoluted tubule, to determine by means of ferritin tracers whether the glomerular basement membrane has been compromised, and to analyze by scanning electron microscopy various regions of the kidney for manifestations of cellular toxicity. (KR)

DESCRIPTORS: (U) \*CYTOCHEMISTRY, \*PENTANES, \*CYTOTOXIN, \*TOXICITY, CELL STRUCTURE, CELLS, ELECTRON MICROSCOPY, ELECTRONIC SCANNERS, GLOMERULI, KIDNEYS, LIVER, MALES, MEMBRANES(BIOLOGY), RATS, REGIONS, TISSUES(BIOLOGY).

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A5, \*Trimethylpentane, \*Pentane-Trimethyl.

ABSTRACT: (U) The first six months of the contract have been devoted to examining the effects of perfluorinated acids and polyhalogenated aromatic hydrocarbons on the colony-forming ability of L5178Y cells. Two sub clones of this cell line have been utilized. One sub clone is designated L5178Y TK+/. The two cell lines differ markedly in their growth characteristics. L5178Y TK+/- cells tend to associate in clumps of cells and are grown in a shaker incubator to produce better cell suspensions. L5178Y TK+/- cells grow as a single cell suspension without agitation. The toxic response of both cell lines after treatment with the perfluorinated acids (perfluoro-n-decanoic acid) was measured. In summary, the results for the perfluorinated acids with chain length of 9 or 10 indicate that there is some dissociation of colony growth from suspension growth. Medium type does not affect the toxicity. This would imply that these perfluorinated acids are producing toxicity through a membrane interaction. The dissociation appears to occur in the TK+/- cells at concentrations approximately 20 higher than those previously reported. (aw)

DESCRIPTORS: (U) \*ORGANIC ACIDS, \*CELLS(BIOLOGY), \*CLONES, \*TOXICITY, \*HALOGENATED HYDROCARBONS, \*AROMATIC HYDROCARBONS, \*COLONIES(BIOLOGY), DISSOCIATION,

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AD-A216 819 CONTINUED

FLUORINATION, CELL DIVISION, INTERACTIONS,  
MEMBRANES(BIOLOGY), RESPONSE, POLYMERS, DECANES,  
CONCENTRATION(CHEMISTRY).

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5,  
\*Perfluorinated Acids, \*Decanoic Acids, \*Polyhalogenated  
Aromatic Hydrocarbons, Colony Forming Cells, Cell  
Suspensions.

AD-A216 815 6/10

CALIFORNIA UNIV DAVIS DEPT OF ANIMAL PHYSIOLOGY  
(U) Isolation of Circulatory Influence in HSG.

DESCRIPTIVE NOTE: Final rept. 1 Oct 77-31 Mar 80,  
MAR 80

PERSONAL AUTHORS: Burger, R. E.; Smith, A. H.; Walgenbach,  
S. C.

CONTRACT NO. AFOSR-77-3430

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-89-1774

UNCLASSIFIED REPORT

ABSTRACT: (U) The respiratory and circulatory function in chickens exposed to high sustained Gz (HSGz), greater than 6 G for 15 seconds is reported. In mammals, such treatment induces ventilation perfusion inequalities and pulmonary shunts which limit tolerance. Chicken lungs undergo little distortion during acceleration exposure because of their inelastic, noncompliant nature. Acceleration tolerance time (T(t), min) for cocks exposed to +6, +8, +10, and +12 Gz is hyperbolically related to the field strength (G):  $T(t) = (240.15/G) - 18.61$ . This indicates that the product of exposure time and field intensity is constant over the range examined. Chickens, unlike mammals, have near normal PaO2 and PaCO2 during Hsgz exposure. Forced ventilation of centrifuging chickens with oxygen increased paO2, a response not found with mammals. Ventilation of one lung with air at 1 G produced near normal paO2 and PaCO2, but in HSGz it gave low PaO2 as compared to spontaneously breathing mammals. Ventilation did not extend all tolerance times, indicating that circulatory impairments are factors limiting acceleration tolerance. Expired PCO2 during oxygen down to zero for several seconds; after HSG, expired PCO2 increased, indicating that oxygen debt and metabolism/perfusion inequalities occurred during HSGz. (AW)

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AD-A216 814 15/5

DESCRIPTORS: (U) \*ACCELERATION TOLERANCE, \*CIRCULATION,  
\*RESPIRATION, ACCELERATION, CHICKENS, DISTORTION,  
EXPOSURE(PHYSIOLOGY), FIELD INTENSITY, FUNCTIONS,  
INEQUALITIES, ISOLATION, LUNG, MAMMALS, OXYGEN, PERFUSION,  
RESPIRATORY SYSTEM, SHUNTS, TIME, TOLERANCE, VENTILATION,  
CARBON DIOXIDE, PARTIAL PRESSURE, HIGH VELOCITY.

ARIZONA UNIV TUCSON DEPT OF MATHEMATICS

(U) Imperfect Repair for Multi-Unit Systems and  
Description of Life Lengths by Conditional Failure  
Rates.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 84-31 May  
88,

MAY 88

PERSONAL AUTHORS: Shaked, Proessor M.

CONTRACT NO. AFOSR-84-0205

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-1684

UNCLASSIFIED REPORT

ABSTRACT: (U) Results have been obtained on the influence of the working environment and of the current wear of the components on the failure rate of each component in a system. Results have also been obtained on the impact on system reliability of imperfect component repair. Studies have been completed on replacement and maintenance policies for multi-unit systems. Often when a component of a system failed it is not scrapped, but instead it undergoes a repair. The repair may be successful and then it brings the item to its state just before failure. The repair may be unsuccessful and then the item is scrapped and replaced. When this is the situation then we say that the component is imperfectly repaired. Under the covered grant we studied various properties of systems with several units, each of which undergoes an imperfect repair upon failure. Upon failure, the probability of a successful repair may depend on several factors. We have considered the situation in which this probability depends on the working environment and on the wear of the components of the system. (jes)

DESCRIPTORS: (U) FAILURE, MAINTENANCE, POLICIES, RATES, RELIABILITY, REPAIR, WEAR.

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AD-A216 813 17/4

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

CALIFORNIA INST OF TECH PASADENA DEPT OF ELECTRICAL  
ENGINEERING

(U) Coding for Spread-Spectrum Channels in the Presence of  
Jamming.

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 83-30 Jun  
88.

JUN 88

PERSONAL AUTHORS: McEliece, Robert J.

CONTRACT NO. AFOSR-83-0296

PROJECT NO. 2304

TASK NO. B1

MONITOR: AFOSR  
TR-89-1683

UNCLASSIFIED REPORT

ABSTRACT: (U) The research supported by this grant has  
led to a significantly improved mathematical  
understanding of the problems associated with  
communication in a hostile environment. The basic  
approach has been to apply the techniques and insights of  
information theory. The results obtained have given  
insight into how to best design communication systems  
which must function under severe noise. (rrh)

DESCRIPTORS: (U) \*CHANNELS, \*CODING, \*COMMUNICATION AND  
RADIO SYSTEMS, \*INFORMATION THEORY, \*JAMMING, \*NOISE,  
\*SPREAD SPECTRUM, ENEMY, ENVIRONMENTS, HIGH RATE,  
INTENSITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304B1.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 811 12/3

WASHINGTON UNIV SEATTLE DEPT OF APPLIED MATHEMATICS

ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF MATHEMATICS  
STATISTICS AND COMPUTER SCIENCE

(U) Numerical Algorithms for Parallel Computers.

(U) Optimum Selection Procedures in Multi-Stage Screening,  
Reliability, and Time.

DESCRIPTIVE NOTE: Final technical rept. 1 May 86-31 Aug  
89.

DESCRIPTIVE NOTE: Final technical status rept. 1985-1989.

AUG 89

OCT 89

PERSONAL AUTHORS: Adams, Loyce M.

PERSONAL AUTHORS: Miescke, Klaus J.

CONTRACT NO. AFOSR-86-0154

CONTRACT NO. AFOSR-85-0347

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A3

TASK NO. A5

MONITOR: AFOSR

TR-89-1685

MONITOR: AFOSR

TR-89-1686

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Throughout the duration of this grant, progress has been made on five fronts: analysis of parallel iterative methods using Fourier analysis techniques, preconditioners for linear systems on parallel architectures, numerical grid generation algorithms for fighter aircraft configurations, parallel domain decomposition algorithms for symmetric eigenvalue problems, and parallel language design issues from an applications point of view. (jhd)

ABSTRACT: (U) Contents: Two-stage Selection Procedures With Screening at the First Stage; Weibull Populations: Normal Populations; Binomial Populations; One-stage Selection Procedures for Nonsymmetric Models; Reliability and Replacement Models; and Trend Analysis in Time Series. (jhd)

DESCRIPTORS: (U) \*ALGORITHMS, \*COMPUTER ARCHITECTURE, \*PARALLEL PROCESSING, COMPUTERS, CONFIGURATIONS, DECOMPOSITION, EIGENVALUES, FIGHTER AIRCRAFT, FOURIER ANALYSIS, GRIDS, ITERATIONS, PROGRAMMING LANGUAGES, LINEAR SYSTEMS, PARALLEL PROCESSORS, NUMERICAL METHODS AND PROCEDURES, SYMMETRY.

DESCRIPTORS: (U) \*RELIABILITY, \*SELECTION, ASYMMETRY, BINOMIALS, MODELS, OPTIMIZATION, PATTERNS, NORMAL DISTRIBUTION, POPULATION, POPULATION(MATHEMATICS), REPLACEMENT, STAGING, TIME SERIES ANALYSIS, WEIBULL DENSITY FUNCTIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A3.

IDENTIFIERS: (U) Trend Analysis, PE61102F, WU-FOSR2304A5.

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AD-A216 793 CONTINUED

RADIOMANA PARIS (FRANCE)

STATIONS, TRANSFER FUNCTIONS.

(U) Study of Original Phases Stations Correction and Common Signal.

IDENTIFIERS: (U) WUAFOSR449304, PE62714E.

DESCRIPTIVE NOTE: Final rept. 1 Dec 83-30 Nov 84,

JAN 85

PERSONAL AUTHORS: Massinon, B.; Mechler, P.

CONTRACT NO. AFOSR-85-0082, \$\$ARPA Order-4493

PROJECT NO. 4493

TASK NO. 04

MONITOR: AFOSR  
TR-89-1827

UNCLASSIFIED REPORT

**ABSTRACT:** (U) In a first approach, we have evaluated the attenuation due to geometrical spreading and anelasticity of recorded regional phases for a set of selected earthquakes which occurred in France or around the French territory. This purely experimental study led to the conclusion that a global attenuation factor in the range of distances from 100 to 1000km could be defined on broad band data (0.5 - 16Hz). In a second approach, we tried to model regional phases by using the Bouchon's method, in order to understand the influence of the source (depth, source mechanism) and of the propagation model on the seismograms built at various distances. The principal part of this report concerns the study of Lg phases in France. We show here that it is possible to derive directly from the records, not only the attenuation but simultaneously the source function and the transfer function at each station. We also present in this report, the first part of a signal processing, which will enable to improve the magnitude determination of quakes as well as the transfer function of our network for teleseisms. Keywords: Seismic waves; Attenuation; Data processing. (AW)

**DESCRIPTORS:** (U) \*SEISMIC DATA, \*SEISMIC WAVES, \*SIGNAL PROCESSING, ATTENUATION, BROADBAND, CORRECTIONS, DATA ACQUISITION, DATA PROCESSING, EARTHQUAKES, FRANCE, FUNCTIONS, GLOBAL, MODELS, PROPAGATION, SIGNALS, SOURCES,

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AD-A216 792 25/2 17/1

AD-A216 791 12/9

ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH KJELLER

JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB

(U) Development and Evaluation of a Regional Seismic Array in Norway - Acquisition of Automatic Data Processing Equipment.

(U) Investigation of Neural Network Dynamics.

DESCRIPTIVE NOTE: Final rept. : Sep 87-31 Jan 89,

JAN 89

NOV 85

PERSONAL AUTHORS: Radoski, Frode

PERSONAL AUTHORS: Pineda, Fernando J.

CONTRACT NO. F49620-85-C-0016, \$SARPA Order-4950

CONTRACT NO. AFOSR-87-0354

PROJECT NO. 2309

PROJECT NO. 2304

TASK NO. A1

TASK NO. A7

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-1880

TR-89-1828

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The NORESS field installations were visited and several modifications and improvements were implemented. Shielding of cables, modifications to the hub processor and alteration of the power supply system has contributed to increased system reliability. These changes have led to a reduced error rate, and the data from NORESS are presently without errors. The performance of the NORESS Earth station for transmission of seismic data to the US has been very good during the reporting period. The new oscillator installed by COMSAT General in March is very stable in frequency, and there has been no need for frequency adjustments after this installation. A few outages during June were due to thunderstorms that caused power breaks in the array area. (jhd)

**DESCRIPTORS:** (U) \*SEISMIC ARRAYS, ACQUISITION, ARRAYS, AUTOMATIC, ELECTRIC CABLES, DATA PROCESSING EQUIPMENT, DATA TRANSMISSION SYSTEMS, ERRORS, INSTALLATION, NORWAY, OSCILLATORS, POWER SUPPLIES, RATES, REDUCTION, RELIABILITY, SEISMIC DATA, SEISMIC DETECTION, ELECTROMAGNETIC SHIELDING, STATIONS, THUNDERSTORMS.

**IDENTIFIERS:** (U) NORSEAR(Norwegian Seismic Array), WUAFOSR2309A1, PEB1102F.

AD-A216 792

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**ABSTRACT:** (U) The purpose of this document is to report the progress made in the first year of the grant entitled Investigation of Neural Network Dynamics. The proposed period of the work was September 1, 1987 to August 31, 1990. The proposed three year budget was \$126,200 with a first year budget of \$40,000. The grant was closed after a single year because the principal investigator moved from the Applied Physics Laboratory, California Institute of Technology. Nevertheless, many of the initial objectives were met in the single year that the grant was in force. The major result of this investigation is a systematic approach for exploiting the dynamics of a general class of neurodynamical systems for the purpose of neural computation. We have interpreted the back-propagation formalism as an adaptive algorithm for a general class of dynamical systems. The completely continuous formalism lends itself to implementation in analog VLSI. This can be accomplished without external synchronization.

**DESCRIPTORS:** (U) \*DYNAMICS, \*NEURAL NETS, ADAPTIVE SYSTEMS, ALGORITHMS, CALIFORNIA, COMPUTATIONS, EXTERNAL, NERVOUS SYSTEM, SYNCHRONIZATION(ELECTRONICS).

**IDENTIFIERS:** (U) WUAFOSR2304A7, PEG1102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 790 CONTINUED

TACAN CORP CARLSBAD CA

(U) Nonlinear Optical Interactions in Semiconductors.

DESCRIPTIVE NOTE: Semi-annual rept. 10 Aug 84-9 Feb 85,

FEB 85

PERSONAL AUTHORS: Salour, Michael M.

CONTRACT NO. F49620-83-C-0147

PROJECT NO. 2306

TASK NO. C2

MONITOR: AFOSR  
TR-89-1833

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The optical pumping technique in GaAs has led to the development of a novel and highly sensitive optical temperature sensor. Experiment were completed on two-photon optical pumping pumping ZnO. An external cavity semiconductor laser involving ZnO as a gain medium was demonstrated under two-photon excitation. This laser should have major impact on the development of tunable blue-green radiation for submarine communication. Two large laser systems were received along with a variety of test and measurement equipment. These lasers were used to explore elementary excitation in optical thin film layers of semiconductors. Also, demonstrated was the feasibility of room temperature operation of a tunable coherent source involving multiple quantum well material. The construction was completed of a simple remote (non-contact) temperature sensor to directly measure heat buildup in semiconductor materials as a result of high power optical laser systems, is in the planning stage. Attempts are focused on observing a number of new optical effects including nonlinear absorption and transmission phenomena, enhanced spontaneous and stimulated light scattering processes, etc. The construction of an external cavity semiconductor laser has been completed. This will allow us to undertake a careful study of multi-photon optical pumping in semiconductors to generate IR radiation and a variety of studies involving narrow-gap semiconducting compounds. (jhd)

AD-A216 790

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**DESCRIPTORS:** (U) \*UNDERWATER COMMUNICATIONS, \*OPTICAL DETECTORS, \*OPTICAL PUMPING, \*TEMPERATURE SENSITIVE ELEMENTS, RADIATION ABSORPTION, BLUE(COLOR), COHERENCE, EXCITATION, EXTERNAL, GAIN, GREEN(COLOR), GALLIUM ARSENIDES, ZINC OXIDES, HEAT, INTERACTIONS, LASER CAVITIES, LAYERS, LIGHT SCATTERING, NONLINEAR ABSORPTION, NARROW GAP SEMICONDUCTORS, NONLINEAR SYSTEMS, OPTICAL MATERIALS, OPTICAL PROPERTIES, QUANTUM THEORY, ROOM TEMPERATURE, SEMICONDUCTOR LASERS, SENSITIVITY, SOURCES, STIMULATION(GENERAL), THIN FILMS, TRANSMITTANCE, TUNING.

**IDENTIFIERS:** (U) Two Photon Excitation, Quantum Wells, Blue Green Lasers, WUAFOSR2306C2, PE61102F.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 789 12/9

AD-A216 789 CONTINUED

MASSACHUSETTS UNIV AMHERST DEPT OF COMPUTER AND  
INFORMATION SCIENCE

Stochastic learning automata, Cooperative computing,  
Artificial intelligence. (aw)

(U) Cooperative Interaction of Self-Interested Neuron-Like  
Processing Units.

DESCRIPTORS: (U) \*ADAPTIVE SYSTEMS, \*ARTIFICIAL  
INTELLIGENCE, \*ASSOCIATIVE PROCESSING, \*LEARNING,  
\*NETWORKS, AUTOMATA, CONTROL SYSTEMS, DYNAMICS, ERRORS,  
INTERACTIONS, LAYERS, NERVOUS SYSTEM, NONLINEAR SYSTEMS,  
OUTPUT, PATTERN RECOGNITION, RATES, STOCHASTIC PROCESSES,  
TRAINING.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 86-30 Sep  
89,

NOV 89

PERSONAL AUTHORS: Barto, Andrew G.

CONTRACT NO. AFOSR-87-0030

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-1825

IDENTIFIERS: (U) WUAFOSR2312A1, PE61102F.

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes progress made in the development of connectionist learning methods permitting networks to learn when they cannot be provided with training information of the high quality required by supervised-learning methods. These methods can permit the application of adaptive connectionist networks to tasks involving complex dynamical behavior and high degrees of uncertainty. A method for training layered networks to perform nonlinear pattern recognition and associative memory tasks was refined. The neuron-like units making up these networks learn on the basis of feedback that evaluates behavior but does not specify desired output or directly provide error information. We report how this method is related to gradient-following methods, how its learning rate can be improved, and argue that this method is biologically plausible. A generalized theory of supervised learning was developed, in which training information comes in the form of constraints instead of specifications of desired network outputs. This approach was illustrated by using it to train a simulated multi-jointed manipulator to perform sequences of reaching tasks. Progress was made in the development of reinforcement learning methods for control of dynamical systems. Keywords: Adaptive networks, Neural computing,

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AD-A216 788 9/1

CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

(U) Joint Services Electronics Program.

DESCRIPTIVE NOTE: Final rept. 1 Sep 81-31 Aug 82.

SEP 82

PERSONAL AUTHORS: Angelakos, D. J.

CONTRACT NO. F49620-79-C-0178

PROJECT NO. 2305

TASK NO. A9

MONITOR: AFOSR  
TR-89-1820

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) An annual report of the JSEP (Joint Services Electronics Program) in Electromagnetics Solid State Electronics, Materials and Devices, Quantum Electronics, and Information Services in presented. In addition, results of the research to date are summarized and significant accomplishments are indicated. (rrh)

DESCRIPTORS: (U) \*ELECTROMAGNETIC FIELDS, QUANTUM ELECTRONICS, SOLID STATE ELECTRONICS.

IDENTIFIERS: (U) WUAFOSR2305A9, PE61102F.

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AD-A216 787 6/4 5/8

ARIZONA STATE UNIV TEMPE DEPT OF PSYCHOLOGY

(U) Tutorial Conference on Neural Modeling.

DESCRIPTIVE NOTE: Final rept.,

JAN 85

PERSONAL AUTHORS: Killeen, Peter

CONTRACT NO. AFOSR-83-0103

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-1832

UNCLASSIFIED REPORT

ABSTRACT: (U) On April 11-15, 1983, a tutorial conference on neural modelling was held in Scottsdale, Arizona. The conference was supported by the Air Force Office of Scientific Research, by the Office of Naval Research, and by Arizona State University. The conference was organized by Peter Killeen and David Hestenes of ASU, and by Robert Hecht-Nielsen of TRW, Inc. The principal speaker was Stephen Grossberg, Center for Adaptive Systems, Boston University. The goal was to provide a clear and concise exposition of the major concepts, themes and results of neural modelling, and to explore its implications for associated psychological disciplines. The format devoted the mornings to lectures by Grossberg on his theory of neural networks, and the afternoons to presentations by invited participants who also worked on neural models, or who generated empirical data pertinent to the predictions of those models. The following reviews and abstracts will provide you with an idea of the issues discussed in relation to neural models that week.

DESCRIPTORS: (U) \*NEURAL NETS, \*PSYCHOLOGY, \*TEACHING METHODS, ADAPTIVE SYSTEMS, ARIZONA, MODELS, NERVOUS SYSTEM, SYMPOSIA, THEORY.

IDENTIFIERS: (U) WUAFOSR2312A1, PE61102F.

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AD-A216 786 8/11  
RADIOMANA PARIS (FRANCE)

(U) Investigation on Local Seismic Phases and Evaluation  
of Body Waves Magnitude.

DESCRIPTIVE NOTE: Rept. 1 Dec 84-31 May 85,

MAY 85

PERSONAL AUTHORS: Mechler, Pierre; Massinon, Bernard

CONTRACT NO. AFOSR-85-0033, \$ARPA Order-4493

PROJECT NO. 2309

TASK NO. A1

MONITOR: AFOSR  
TR-89-1829

UNCLASSIFIED REPORT

ABSTRACT: (U) The research done under the grant is progressing quite normally. The main results were reported at the DARPA meeting held at the USAF Academy, Colorado Springs in May 1985. (rrh)

DESCRIPTORS: (U) \*SEISMOLOGY, PHASE.

IDENTIFIERS: (U) WUAFOSR2309A1, PES1102F.

AD-A216 786

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AD-A216 785 20/6 20/12 20/2

HONEYWELL INC BLOOMINGTON MN

(U) Nonlinear Optical Phenomena in Solids.

DESCRIPTIVE NOTE: Semiannual rept. 9 Jul 84-8 Jan 85,

FEB 85

PERSONAL AUTHORS: Kruse, Paul W.

CONTRACT NO. F49620-84-C-0034

PROJECT NO. 2306

TASK NO. C2

MONITOR: AFOSR  
TR-89-1831

UNCLASSIFIED REPORT

ABSTRACT: (U) The dynamics of electron gratings formed in  $\text{Hg}(1-x)\text{Cd}(x)\text{Te}$  at 80 K by the interference of pump and probe beams from a Carbon Dioxide TEA laser has been investigated. A CO<sub>2</sub> TEA laser beam incident upon the backside of the sample quenches the forward mode phase conjugate signal from the pump and probe beams, with a response time no greater than 40 nsec. A model has been proposed based upon two-photon absorption and Auger recombination. A theoretical analysis of  $\text{GaAs}/\text{Al}_x\text{Ga}_{1-x}\text{As}$  and  $\text{Hg}(1-x)\text{Cd}(x)\text{Te}/\text{Hg}(\text{y})\text{Cd}(1-y)\text{Te}$  superlattices shows that the photo-excited plasma mechanism does not give rise to an appreciably larger third order susceptibility than bulk alloys. However, the third order nonparabolicity can be two orders of magnitude higher in the  $\text{GaAs}/\text{Al}_x\text{Ga}_{1-x}\text{As}$  superlattices than in the bulk alloy. There is no increase in the third order susceptibility due to conduction band nonparabolicity in  $\text{Hg}(1-x)\text{Cd}(x)\text{Te}/\text{Hg}(\text{y})\text{Cd}(1-y)\text{Te}$  superlattices compared with the bulk alloy. Keywords: Mercury cadmium tellurides, Gallium aluminum arsenide, Real time electron gratings, Dependence of diffracted beam signal upon erase beam intensity, Gallium arsenides (aw)

DESCRIPTORS: (U) \*CARBON DIOXIDE LASERS, \*OPTICAL PHENOMENA, \*TEA LASERS, ALLOYS, ALUMINUM ARSENIDES, AUGERS, CONDUCTION BANDS, DIFFRACTION, DYNAMICS.

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ELECTRONS, SOLIDS, NONLINEAR SYSTEMS, GALLIUM ARSENIDES, GRATINGS(SPECTRA), INTENSITY, MERCURY CADMIUM TELLURIDES, NONLINEAR SYSTEMS, REACTION TIME, REAL TIME, SIGNALS, SUPERLATTICES, THEORY, TWO PHOTON ABSORPTION.

PURDUE UNIV LAFAYETTE IN SCHOOL OF AERONAUTICS AND ASTRONAUTICS

(U) Solid Rocket and Space Propulsion Studies.

IDENTIFIERS: (U) WUAFOSR2306C2, PE61102F.

DESCRIPTIVE NOTE: Final rept. 1 Nov 82-31 Dec 84,

DEC 84

PERSONAL AUTHORS: Glick, Robert L.; Osborn, John R.

CONTRACT NO. F49620-83-K-0008

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-1855

UNCLASSIFIED REPORT

ABSTRACT: (U) Studies were directed at the deflagration of heterogeneous, condensed media. Relations among ballistic properties were studied; generalized relations were derived and existing relations for testing the consistency of data from ballistic test motors were shown to be general to small error; errors in the recent literature were corrected. A new device for characterizing the ballistic properties of condensed media at high pressure with strands was devised and explored analytically. Self-pressurized constant pressure operation was shown along with capability to control the pressure level with a simple bang-bang control system. Special configurations to provide direct little difference measurements of ballistic sensitivities were presented. The Deur/Glick serial sandwich model for heterogeneous propellant combustion was modified to overcome the 'continuation' problem implicit in that model. Results showed ignition delays of correct magnitude and, with physical reasoning, demonstrated that the ZN methodology cannot be applied to heterogeneous propellants in its present form. Keywords: Solid rocket propellants, Solid propellant rocket engines. (AW)

DESCRIPTORS: (U) \*SOLID PROPELLANT ROCKET ENGINES, \*SOLID ROCKET PROPELLANTS, \*DEFLAGRATION, BALLISTICS, COMBUSTION, CONFIGURATIONS, CONSISTENCY, CONTROL SYSTEMS.

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AD-A216 781 CONTINUED

DELAY, ERRORS, HETEROGENEITY, HIGH PRESSURE, IGNITION, MEASUREMENT, PHYSICAL PROPERTIES, PULSE, PULSE MODULATION, REASONING, ROCKETS, SPACE PROPULSION, SPACE SCIENCES, STRANDS, TEST EQUIPMENT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1.

AD-A216 767 11/6.1

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF MATERIALS SCIENCE AND ENGINEERING

(U) A Fundamental Understanding of the Effect of Alloying Elements on the Corrosion Resistance of Rapidly Solidified Mg Alloys.

DESCRIPTIVE NOTE: Final rept. 30 Sep 88-31 Oct 89.

NOV 89

PERSONAL AUTHORS: Kruger, J.; Makar, G. L.; Sieradzki, K.

CONTRACT NO. AFOSR-88-0339

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR  
TR-89-1671

UNCLASSIFIED REPORT

ABSTRACT: (U) This report consists of four publications, two resulting from a previous contract F496620-86-C-0014, P00002. The titles are: Environment-assisted cracking of rapidly solidified Mg-Al alloys; Structure of the passive films on cast and rapidly solidified Mg alloys; The effect of alloying elements on the corrosion resistance of rapidly solidified magnesium alloys; and Corrosion studies of rapidly solidified magnesium alloys. Magnesium aluminum alloys; RS (Rapid Solidification). (edc)

DESCRIPTORS: (U) \*CORROSION RESISTANCE, \*MAGNESIUM ALLOYS, \*SOLIDIFICATION, ADDITIVES, ALLOYS, ALUMINUM ALLOYS, CORROSION, CASTINGS, CRACKS, FILMS, PASSIVE SYSTEMS, QUICK REACTION.

IDENTIFIERS: (U) Alloying elements, Rapid solidification, PE61102F, WUAFOSR2306A1.

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AD-A216 762 12/6

AD-A216 747 12/5

MARYLAND UNIV BALTIMORE DEPT OF MATHEMATICS

WASHINGTON UNIV SEATTLE DEPT OF COMPUTER SCIENCE

(U) Request for a Computer Workstation and Video Peripherals (DURIP).

(U) High Performance Computer Programming Environments.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-30 Apr 89.

DESCRIPTIVE NOTE: Final rept. 1 Oct 87-30 Sep 88.

NOV 89

SEP 88

PERSONAL AUTHORS: Greenberg, James M.

PERSONAL AUTHORS: Snyder, Lawrence; Notkin, David

CONTRACT NO. AFOSR-89-0101

CONTRACT NO. AFOSR-88-0023

PROJECT NO. 3842

PROJECT NO. 2304

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR  
TR-89-1681MONITOR: AFOSR  
TR-89-1682

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Dr. Greenberg, acting as principal investigator under AFOSR Grant 89-0101, entered into a contract with Ardent Computer Corporation of Sunnyvale, California to purchase a four processor Titan at a cost of 129,000. The department also purchased the video output devices outlined in the original proposal. This equipment has been invaluable to both the principal investigator and the other associate investigators on the original proposal. Dr. Greenberg has been engaged on work on flow visualization for models of the Boltzmann equation and Dr. Lo has been doing extensive work on signal processing which utilizes the vector capabilities of the Ardent to its fullest. (KR)

ABSTRACT: (U) This one year grant had the primary goal the assessment of the Poker Parallel Programming environment and the planning and design of new parallel programming environment. These goals were achieved. The new programming environment, to be built on a software platform that permits rapid prototyping of alternative environments, was designed using a three level language abstraction. The central publications include the assessment of Poker, two papers on prototype graphic debugging environment, and two papers on parallel computer structures. Thomas J. Holman completed his Ph.D. degree. (KR)

DESCRIPTORS: (U) \*AUXILIARY, \*COMPUTERS, BOLTZMANN EQUATION, CALIFORNIA, FLOW VISUALIZATION, OUTPUT, PROCUREMENT, SIGNAL PROCESSING, STATIONS, VECTOR ANALYSIS, VIDEO SIGNALS, WORK.

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, COMPUTER PROGRAMS, DEBUGGING(COMPUTERS), DOCUMENTS, ENVIRONMENTS, GRAPHICS, LANGUAGE, PARALLEL PROCESSING, PARALLEL PROCESSORS, PLATFORMS, PROTOTYPES, STRUCTURES.

IDENTIFIERS: (U) PE61102F, WUAFOSR3842A5, \*Peripheral equipment.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A2, Poker Parallel Programming Environment.

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AD-A216 743 6/4

AD-A216 743 CONTINUED

WISCONSIN UNIV-MILWAUKEE DEPT OF PSYCHOLOGY

(U) Perception of Long-Period Complex Sounds.

DESCRIPTIVE NOTE: Annual progress rept. 1 Sep 88-31 Oct 89.

DESCRIPTORS: (U) \*AUDIO TONES, \*AUDITORY PERCEPTION, \*DISCRIMINATION, DISTORTION, FREQUENCY, FUNCTIONS, INVERSION, NOISE(SOUND), PATTERNS, REACTION TIME, REGIONS, SEPARATION, SEQUENCES, SOUND, SPECTRA, STIMULI, VERBAL BEHAVIOR, VOWELS.

NOV 89

IDENTIFIERS: (U) PEG1102F, WJAFOSR2313AG.

PERSONAL AUTHORS: Warren, Richard M.

CONTRACT NO. AFOSR-88-0320

PROJECT NO. 2313

TASK NO. A6

MONITOR: AFOSR  
TR-89-1677

UNCLASSIFIED REPORT

ABSTRACT: (U) Working with recycled sequences of ten 40 ms items the investigators studied the discrimination of minimal changes for: sinusoids, vowels, and frozen noise segments. Listeners made ABX judgments for sequences differing only in the ordering of two contiguous items. In contrast with results previously obtained for ten-item sequences presented in transient one-shot bursts, recycled stimuli were readily discriminated by untrained listeners. The relative difficulty of discriminating tonal patterns (measured by response time) was an inverse function of: a) the frequency separation between the permuted tones; and b) the frequency separation between the tones immediately preceding and following the permuted pair. For the vowel sequences, listeners' trial by trial report indicate that discrimination of order was mediated by verbal organization involving introduction of illusory consonants and distortion of the vowels. Discrimination of order within sequences of frozen noise was more difficult than found with tone or vowel sequence but all listeners performed at levels well above chance. Additional work with recycled frozen noise is proceeding satisfactorily which deals with the ability to remember and recognize segments up to 1 s in duration, and the relative salience of various spectral regions in this process. Keywords: Auditory perception; Complex sounds; Pitch. (jhd)

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AD-A216 741 6/4 5/8

HARVARD UNIV CAMBRIDGE MA DIV OF APPLIED SCIENCES

(U) The Effects of Luminance Boundaries on Color Perception.

DESCRIPTIVE NOTE: Final rept. 15 Sep 86-14 Mar 89,

NOV 89

PERSONAL AUTHORS: Kronauer, Richard E.; Eskew, R. T., Jr.  
; Stromeyer, Charles F., III

CONTRACT NO. AFOSR-86-0338

PROJECT NO. 2313

TASK NO. AS

MONITOR: AFOSR  
TR-89-1676

UNCLASSIFIED REPORT

ABSTRACT: (U) When a suprathreshold luminance flash, presented as an increment on a larger background field, accompanies a circular isoluminant chromatic flash at the same spatial location, chromatic threshold is reduced by about two-fold. This facilitation results from the clearly-visible edges of the luminance flash (the pedestal) serving to demarcate the test region, segregating it from its surround. Recent signal detection experiments show that this facilitation does not occur as a result of the contour's reducing the spatio-temporal detection uncertainty of the observer; instead of merely directing the observer's attention, the pedestal must alter the properties of chromatic detectors (by changing the extent of spatial integration, for instance). A thin luminance ring can be used to create the facilitating contour. Displacing the ring relative to the test causes the facilitation to decline sharply, as if the visual system integrated uniformly within the demarcated region. However, the contour does not have to enclose the test region: small segments of the ring presented on the test circumference have about half the maximum facilitatory effect, while 180 deg of arcs produces the whole effect. These results can be used as a rigorous means of probing the way in which low-level visual attributes (edges, color) interact at higher levels.

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DESCRIPTORS: (U) \*COLOR VISION, \*LUMINANCE, ATTENTION, BACKGROUND, BOUNDARIES, CHROMATICITY, DETECTION, DETECTORS, FLASHES, INTEGRATION, OBSERVERS, OPTICAL IMAGES, POSITION(LOCATION), REGIONS, RINGS, SIGNALS, SPATIAL DISTRIBUTION, TEST AND EVALUATION, THINNESS, THRESHOLD EFFECTS.

IDENTIFIERS: (U) PES1102F, WUAFOSR2313A5.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 740 21/8.2 21/2 21/9.2

AD-A216 739 21/1 21/2

GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE  
ENGINEERING

STANFORD UNIV CA DEPT OF AERONAUTICS AND ASTRONAUTICS

(U) Combustion Instability in Solid Propellant Rockets

(U) An Investigation of Flow Structure, Mixing and  
Chemical Reaction in Combusting Turbulent Flows.

DESCRIPTIVE NOTE: Final rept. Oct 85-Mar 89,

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 84-30 Jun  
89,

MAR 89

OCT 89

PERSONAL AUTHORS: Price, Edward W.; Flandro, Gary A.

PERSONAL AUTHORS: Cantwell, Brian J.; Bowman, Craig T.

CONTRACT NO. F49620-86-C-0005

CONTRACT NO. AFOSR-84-0373

PROJECT NO. 2308

PROJECT NO. 2308

TASK NO. A1

TASK NO. A2

MONITOR: AFOSR  
TR-89-0460MONITOR: AFOSR  
TR-89-1679

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This report constitutes the principal of a book on combustion stability in solid propellant rockets. The present report contains nine chapters that are each substantially complete except for some editorial, bibliographical and art work in some chapters. Chapters 1 thru 9 include: Introduction to Combustion Instability; Combustion Chamber Processes; Guidance in Missile System and Motor Design; Fundamentals of Propellant Combustion; Analytical Modeling of Combustor Flow; Modeling of Combustion Dynamics; Bulk Mode Oscillations and L\* Instability; and Combustor Stability Analysis. (aw)

DESCRIPTORS: (U) \*COMBUSTION STABILITY, \*SOLID PROPELLANT ROCKET ENGINES, \*SOLID PROPELLANTS, BOOKS, COMBUSTION, COMBUSTION CHAMBERS, COMBUSTORS, DYNAMICS, FLOW, GUIDED MISSILES, MATHEMATICAL MODELS, MODELS, MOTORS, OSCILLATION, PROPELLANTS, ROCKETS, STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1, \*Combustion Instability.

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ABSTRACT: (U) An experimental investigation of the relationship between flow structure and flame structure in a low-speed, co-flowing, non-premixed, methane-air jet diffusion flame has been completed. The purpose of the research was to examine the spatial structure of the unsteady reaction process as it relates to the unsteady velocity field and to use topological methods in the interpretation of flame dynamics. A small, acoustically produced, perturbation in the fuel jet velocity was used to phase-lock the basic flickering instability of the flame thus creating a very periodic and controllable flow, suitable for conditional sampling. Various diagnostic techniques were used in the research including single-component laser anemometry, direct and schlieren photography, Mie scattering from seed particles introduced into the flow, planar, laser-induced fluorescence the OH radical and particle tracking for measuring instantaneous planar velocity field data. Velocity fields have been measured as a function of the phase of the flickering cycle over the first 20 diameters of the flame. (KR)

DESCRIPTORS: (U) \*JET MIXING FLOW, \*JET FLAMES, \*UNSTEADY FLOW, \*TURBULENT FLOW, CHEMICAL REACTIONS, DIAGNOSIS(GENERAL), DYNAMICS, LASER INDUCED FLUORESCENCE,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

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AD-A216 733 15/5 12/3

MIE SCATTERING, PARTICLES, PERIODIC VARIATIONS, PHASE  
LOCKED SYSTEMS, SAMPLING, SCHLIEREN PHOTOGRAPHY, SPATIAL  
DISTRIBUTION, STABILITY, TOPOLOGY, TRACKING, METHANE, AIR,  
TURBULENT DIFFUSION, FLICKER, VELOCITY.

ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF MATHEMATICS  
STATISTICS AND COMPUTER S CIENCE

(U) Structured Decision Rules for Ranking and Selecting  
Mailing Lists and Creative Packages for Direct  
Marketing.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

89

PERSONAL AUTHORS: Ehrman, Chaim M.; Miescke, Klaus J.

CONTRACT NO. AFOSR-85-0347

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-1881

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Direct Marketing, v3  
n1 p47-59 1989.

ABSTRACT: (U) The field of direct ail advertising is  
becoming increasingly important. Many selection decisions  
must be made by direct marketers such as those concerning  
package testing and list and segment within list  
selection. The decisions can be quite complex, especially  
when sample sizes and average order size per package and  
list are not equal. In this article, Bayesian and non-  
Bayesian statistics are applied to these problems to  
generate optimal decision rules for package testing and  
list evaluation and selection. An example is given using  
real data from test results. Keywords: Binomial  
distributions and beta priors; Bayes subset selection;  
Confidence bounds for rates; Reprints. (SDW)

DESCRIPTORS: (U) \*MARKETING, \*SELECTION, \*RANKING, BAYES  
THEOREM, BINOMIALS, DECISION MAKING, DECISION THEORY,  
DISTRIBUTION, OPTIMIZATION, REPRINTS, SIZES(DIMENSIONS),  
TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, Packages.

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BRISTOL UNIV (UNITED KINGDOM) DEPT OF INORGANIC CHEMISTRY

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 93. Synthesis of Heteropolynuclear Metal Compounds with Chains of Seven to Eleven Metal Atoms; Crystal Structure of  $(Mo_2W_3Pt_6(Mu_3-CMe)_3(Mu_3-CC_6H_4Me-4)_2(CO)_{10}(PMe_2Ph)_4(Eta-C_5H_5)_5)$ .

89

PERSONAL AUTHORS: Davies, Simon J.; Howard, Judith A.; Musgrove, Rupert J.; Stone, F. G.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-1893

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Society, Dalton Transactions, p2269-2279 1989.

ABSTRACT: (U) We have described rational procedures for preparing polynuclear metal complexes in which from three to seven metal atoms are linked to form chain-like structures. In these species the spines of the molecules consist of metal-metal bonds (W-Pt, Mo-Pt, W-Ni, or Mo-Ni) bridged by alkylidyne groups. The syntheses depend on their success on an isolobal mapping of metal-ligand fragments with organic groups, and the generality of the methodology has recently been demonstrated by its extension to W-Rh chain systems. Reprints. (rrh)

DESCRIPTORS: (U) \*ATOMS, \*BRIDGES, \*CARBENES, \*CHAINS, \*CRYSTAL STRUCTURE, \*LIGANDS, \*METAL COMPLEXES, \*MOLECULES, \*ORGANIC RADICALS, CHEMISTRY, METAL COMPOUNDS, METAL METAL BONDS, METALS, REPRINTS, SPINAL COLUMN, SYNTHESIS

IDENTIFIERS (U) PE61102F, WUAFOSR230382.

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AD-A216 731

UNCLASSIFIED

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EVJ20M

(U) Laser-Induced Chemiluminescence of the LiMg Excimer.

APR 89

PERSONAL AUTHORS: Pichler, G.; Lyyra, A. M.; Kleiber, F. D.; Stwalley, W. C.; Hammer, R.

CONTRACT NO. F49620-85-C-0095

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-1870

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v156 n5 p467-471, 14 Apr 89.

ABSTRACT: (U) A UV Ar(2+) laser was used to excite specific levels in the  $C\ 1\pi(u)$  state of the  $7Li_2$  dimer. A subsequent photochemical reaction with atomic Mg produced the LiMg excimer in excited  $C2\pi$  and  $D\ 2\ \text{Sigma}(+)$  states. The observed bound-free excimer emission spectrum was compared with theoretical emission profiles based on potential energy curves and transition dipole moments between the  $A\ 2\ \pi$  states, and  $B2\ \text{Sigma}(+)$  and  $D2\ \text{Sigma}(+)$  states of LiMg. Reprints. (aw)

DESCRIPTORS: (U) \*CHEMILUMINESCENCE, \*PHOTOCHEMICAL REACTIONS, \*LASER INDUCED FLUORESCENCE, \*EXCIMERS, \*LITHIUM, \*MAGNESIUM, DIPOLE MOMENTS, EMISSION SPECTRA, LASERS, PROFILES, REPRINTS, TRANSITIONS, DIMERS, ELECTRONIC STATES, EXCITATION, POTENTIAL ENERGY.

IDENTIFIERS: (U) WUAFOSR2301A7

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 721 CONTINUED

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Experiments on Bifurcation of Periodic States into Tori for a Periodically Forced Chemical Oscillator.

MAY 88

PERSONAL AUTHORS: Vance, William; Ross, John

CONTRACT NO. AFOSR-87-0120

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1767

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88  
n9 p5536-5546, 1 May 88.

ABSTRACT: (U) We study experimentally continuous transitions from quasiperiodic states for a time-periodically forced chemical oscillator. The chemical reaction is the hydration of 2,3-epoxy-1-propanol, and is carried out in the autonomous system through supercritical Hopf bifurcations as either the total flow rate or the cooling coil temperature is changed. Under conditions of oscillation for the structure of the toroidal flow, stroboscopic phase portraits, and circle maps as a function of the forcing amplitude and period. A continuous transition from the quasiperiodic to a periodic state, in which the two-torus contracts to a closed curve (Neimark-Sacker torus bifurcation), is observed as the forcing period is changed at a constant moderate forcing amplitude. Qualitative theoretical predictions compare well with the experimental observations. This paper presents the first experimental observation of a Neimark-Sacker torus bifurcation in a forced chemical oscillator system, and relates the bifurcation diagram of the unforced system to that of the forced system reprints. (aw)

DESCRIPTORS: (U) \*OSCILLATORS, \*PROPANOLS, \*EPOXY COMPOUNDS, \*HYDRATION, \*BIFURCATION(MATHEMATICS), \*PHASE TRANSFORMATIONS, CHEMICAL REACTIONS, CHEMICALS, CHEMISTRY.

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CIRCLES, COILS, COOLING, FLOW, FLOW RATE, GRAPHS, MAPS, OBSERVATION, OSCILLATION, PREDICTIONS, REPRINTS, TEMPERATURE, THEORY, TOROID; TRANSITIONS, MOLECULAR STATES, QUANTUM CHEMISTRY, PHASE DIAGRAMS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B1, \*Periodic States, \*Chemical Oscillators, Quasiperiodic States, Supercritical Hopf Bifurcations, Toroidal Flow, Stroboscopic Phases, Neimark-Sacker Torus Bifurcation.



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 72C CONTINUED

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Synthetic, Structural, and Theoretical Studies of  
Diphenyltetrazene Complexes of Silicon and Germanium,

CERAMIC MATERIALS, CHEMICAL AGENTS, CHEMICAL REACTIONS,  
COUPLING(INTERACTION), GERMANIUM, HYDRAZINE DERIVATIVES,  
HYDRAZINES, LIGANDS, NITRIDES, OXIDATION, REPRINTS,  
SEMICONDUCTORS, SILICON, STRUCTURAL PROPERTIES, SYNTHESIS,  
THEORY.

89

PERSONAL AUTHORS: Miller, Glenn A.; Lee, Soon W.; Trogler,  
William C.

IDENTIFIERS: (U) PE61102F. WUAFOSR230382.

CONTRACT NO. AFOSR-86-0027

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1872

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v8 p738-744  
1989.

ABSTRACT: (U) We recently reported the preparation of  
several transition-metal tetrazene (also called  
tetrazadiene, tetraazabutadiene, or tetrazenido)  
compounds from the readily available tetrazenido dianion.  
This reagent has permitted the synthesis of tetrazene  
complexes for Ni, Pd, and Pt allowing for the first time  
a comparison of metal-tetrazene bonding within a triad.  
Main-group tetrazene compounds may also be useful as  
precursors to interesting materials, such as ceramics and  
semiconducting nitrides. Structural studies of the main  
group systems aid in the analysis of bonding within the  
N4 backbone of the tetrazene ligand in transition-metal  
complexes but should be diminished in main group  
analogues. The few known main-group tetrazene complexes  
have been prepared by an oxidative coupling of hydrazine  
derivatives, by coupling lithiated hydrazines with  
aryldiazonium salts, or by the 2 + 3-cycloaddition  
reaction between azides and substituted silaketimines.  
Herein we describe metathesis reactions with main-group  
substrates, which suggest 1 offers a convenient entry to  
the synthesis of main-group tetrazene compounds of group  
14. Reprints. (aw)

DESCRIPTORS: (U) \*TETRAZENES, \*TRANSITION METALS, AZIDES,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 713 7/3

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CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

SAN DIEGO STATE UNIV CA CENTER FOR RESEARCH IN MATHEMATICS AND SCIENCE EDUCATION

(U) Structure of Bis(1,10-Phenanthroline) Trifluoromethanesulfonate Lithium,

(U) Schema-Based Theories of Problem Solving.

89

DESCRIPTIVE NOTE: Annual rept. 1 Nov 88-31 Oct 89.

PERSONAL AUTHORS: Lee, Soon W.; Trogler, William C.

NOV 89

CONTRACT NO. AFOSR-86-0027

PERSONAL AUTHORS: Reed, Stephen K.

PROJECT NO. 2303

CONTRACT NO. AFOSR-89-0107

TASK NO. B2

PROJECT NO. 2313

MONITOR: AFOSR TR-89-1871

TASK NO. A4

MONITOR: AFOSR TR-89-1673

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Acta Crystallographica, Section B: Structural Crystallography and Crystal Chemistry, VC45 p1152-1154 1989.

ABSTRACT: (U) Alkali-metal cations usually form 1:1 complexes with the 1,10-phenanthroline (phen) ligand, except for the O-nitrophenolates of Na(+), K(+), Rb(+), and Cs(+), to which two molecules of phenanthroline are added. The relatively small Na(+) and K(+) cations form 1:2 complexes only when the reaction mixture contains foreign proton-donor species which stabilize the counter anion. In this paper, we report that the small Li(+) cation forms a stable complex with two equivalents of 1,10-phenanthroline in a nonprotic solvent, Methylene chloride, by use of the weakly basic trifluoromethanesulfonate counter ion. Reprints. (aw)

DESCRIPTORS: (U) \*CATIONS, \*METAL COMPLEXES, \*LITHIUM COMPOUNDS, \*PHENANTHRENES, \*MOLECULAR STRUCTURE, \*ALKALI METALS, \*CHEMICAL REACTIONS, \*CHLORIDES, \*METHYLENES, \*MIXTURES, \*MOLECULES, \*REPRINTS, \*STABILITY, \*SULFONATES, \*METHANES, \*FLUORINATED HYDROCARBONS, \*LIGANDS, \*COMPOUNDS.

IDENTIFIERS: (U) PEG1102F, WJAFDSR2303B2, \*Phenanthrolines, Lithium/Bis(1-10-Phenanthroline) Trifluoromethanesulfonate, Trifluoromethanesulfonate, Sulfonate/Trifluoromethane, Counter Ions.

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ABSTRACT: (U) The objective of this research is to construct a schema-based model of problem solving to represent construction of equations for solving algebra word problems. The research summarized in this report is concerned with the selection, use, and description of instructional examples. Experiment 1 shows that mathematical experience was beneficial for improving the selection of good analogies when the analogies are isomorphic to the test problems, but was not beneficial when the analogies are more inclusive than the test problems. In Experiment 2 students were able to effectively combine information from two analogous problems but did significantly worse when combining information from one example and a set of procedures. The last three experiments required that students categorize motion problems according to whether the two distances in a problem should be equated, added, or subtracted. Categorization significantly improved as the number of training examples representing a category increased from one to four (Experiment 3). Categorization was also significantly better when students received both specific and general descriptions of the examples than when they received only a single description (Experiment 4). However, as shown in Experiment 5, students were unable to form their own general descriptions by comparing similar examples. (RRH)

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 715 11/2 7/4 7/1 11/4

CLARKSON UNIV POTSDAM NY DIV OF RESEARCH

DESCRIPTORS: (U) \*TRAINING, ALGEBRA, CONSTRUCTION,  
EQUATIONS, MATHEMATICS, MOTION, PROBLEM SOLVING, STUDENTS,  
TEST AND EVALUATION, WORDS(LANGUAGE).

(U) Colloid and Interface Chemistry Aspects of Ceramics.  
DESCRIPTIVE NOTE: Final technical rept. 1 Aug 85-31 Aug  
89.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A4.

NOV 89

PERSONAL AUTHORS: Matijevic, Egon

CONTRACT NO. F49620-85-C-0142

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1672

## UNCLASSIFIED REPORT

ABSTRACT: (U) This comprehensive, long term, interdisciplinary program has a dual purpose: a) To generate new or better defined dispersed solids as starting materials for controlled microstructures, with special emphasis on electrooptic ceramics, as well as composites that meet armor and antiarmor requirements. b) To develop a better understanding of interfacial processes responsible for different properties of high performance ceramics. With respect to a), several powders of simple and mixed composition have been prepared including zirconium, cerium, yttrium, gadolinium, europium, samarium, and terbium compounds. Furthermore, particles of internally mixed composition of Y(III)/Ce(III) and Zr(IV)/Y(III) basic carbonates and oxides in varying molar ratios have been synthesized. Finally, particles of different cores coated with other compounds have been obtained, such as oxides of chromium, iron, and titanium covered with alumina, or of iron oxide coated with zirconia or yttria. The powders so obtained were of narrow size distribution with particles of different morphologies, including spheres. These materials were characterized in terms of their various properties (porosity, optical, magnetic, electrokinetic, etc.). With respect to b), the studies involved solid/solute and solid/solid interactions. The adsorption of chelating agents on iron oxides was used to affect the surface

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potential and dissolution of the finely dispersed solids  
(aw)

STANFORD UNIV CA DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*COLLOIDS,  
ADSORPTION, ALUMINUM OXIDES, ANTIARMOR AMMUNITION, ARMOR,  
CERIUM, CHELATING AGENTS, CHEMISTRY, CHROMIUM, CONTROL,  
DISPERSING, DISTRIBUTION, ELECTROOPTICS, EUROPIUM,  
GADOLINIUM, INTERACTIONS, INTERFACES, IRON, IRON OXIDES,  
MICROSTRUCTURE, OXIDES, PARTICLES, POROSITY, POWDERS,  
REQUIREMENTS, SAMARIUM, SIZES(DIMENSIONS), SOLIDS,  
SOLUTES, SPHERES, SURFACES, TERBIUM COMPOUNDS, TITANIUM,  
YTTRIUM, YTTRIUM OXIDES, ZIRCONIUM, ZIRCONIUM OXIDES,  
DISSOLVING.

(U) Crystal Growth and Mechanical Properties of  
Semiconductor Alloys.

DESCRIPTIVE NOTE: Final rept. 15 Apr 88-15 Apr 89.

NOV 89

PERSONAL AUTHORS: Stevenson, David A.

CONTRACT NO. AFOSR-86-0158

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

PROJECT NO. 2306

TASK NO. B1

MONITOR: AFOSR  
TR-89-1688

UNCLASSIFIED REPORT

ABSTRACT: (U) We describe a study of the mechanical properties and crystal growth of compound semiconductor alloys. We also investigated experimental conditions that may influence the hardness values and, hence, might explain the large variations in hardness values that are described in literature for many semiconductors, specifically the following: 1) differences in the hardness of different grains, across twins, and as the sample is rotated that may rise from crystal orientation affects; 2) differences in hardness arising from the photoplastic effect; and 3) differences in hardness arising from differences in applied loads during hardness testing. We propose to continue this work by: 1) expanding our study a wider range of composition of ZnTe-CdTe superlattices; 2) investigating both strained layer and lattice matched superlattices of InGaAsP; 3) investigating superlattices of Si and Ge; and 4) investigating creep in HgTe and other semiconductors of relatively low melting temperatures. (KR)

DESCRIPTORS: (U) \*ALLOYS, \*CRYSTAL GROWTH, \*MECHANICAL PROPERTIES, CREEP, CRYSTALS, HARDNESS, LOW TEMPERATURE, MELTING, ORIENTATION(DIRECTION), PHOTOPLASTIC MATERIALS, SEMICONDUCTORS, SUPERLATTICES, TEST AND EVALUATION, VALUE.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 697 CONTINUED

AD-A216 694 11/9 20/11

IDENTIFIERS: (U) PE61102F, WUAFOSR230681.

AKRON UNIV OH INST OF POLYMER SCIENCE

(U) Fundamental Studies of Time-Dependent Response and Fracture of Cross-Linked Polymers.

DESCRIPTIVE NOTE: Final rept.,

JUN 89

PERSONAL AUTHORS: Kelley, Frank N.; Morton, Maurice; von Meerweil, Ernst

CONTRACT NO. F49620-86-C-0032

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1756

UNCLASSIFIED REPORT

ABSTRACT: (U) The objectives of these studies are: i) To determine the relationships of polymer structure, network topology and other microstructural features to time-dependent, small deformation properties such as creep and volume relaxation in thermosetting resins. ii) To determine the relationships between polymer network structure and the fracture energy of thermosetting resins. Epoxy resins based on diglycidyl ether of bisphenol A (DGEBA) and diamino diphenyl sulfone (DDS) have been prepared using an homologous series of 5 prepolymer molecular weights and a stoichiometric ratio of reactants. Resultant networks were characterized as a graded series having increasing network chain lengths and decreasing T(g). The series of Epoxy resins based on the diglycidyl ether of bisphenol A has been extensively investigated during and after curing. The degree of cure was monitored by four different methods: 1) density increase, 2) heat of reaction evolution, 3) glass temperature, T(g), increase, and 4) infrared absorption by the glycidyl ether group. The epoxy resins studied indicated that only a single reaction path was followed during the curing but the kinetics were, of course, highly temperature sensitive. (aw)

DESCRIPTORS: (U) \*CROSSLINKING(CHEMISTRY). \*DEFORMATION.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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\*EPOXY RESINS, \*FRACTURE(MECHANICS), \*MICROSTRUCTURE, ABSORPTION, CHAINS, CREEP, ENERGY, EVOLUTION(GENERAL), GLASS, GLYCIDYL ETHER, HEAT OF REACTION, INFRARED RADIATION, LENGTH, MOLECULAR WEIGHT, NETWORKS, PATHS, PHENYL ETHER, POLYMERS, RATIOS, REACTANTS(CHEMISTRY), RELAXATION, STOICHIOMETRY, TEMPERATURE, THERMOSETTING PLASTICS, TIME DEPENDENCE, TOPOLOGY, VOLUME, PHENOLS, SULFONES.

CALIFORNIA STATE UNIV NORTHRIDGE

(U) Low Scan Angle Performance of Airborne Flush Mounted Communication Antennas.

DESCRIPTIVE NOTE: Final rept. 1 May 78-30 Apr 79.

JAN 80

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

PERSONAL AUTHORS: Cable, V. P.

CONTRACT NO. AFOSR-78-3624

PROJECT NO. 2304

TASK NO. D9

MONITOR: AFOSR  
TR-89-1803

UNCLASSIFIED REPORT

ABSTRACT: (U) The Duration of this contract was spent performing a literature search on current techniques for analysis and synthesis of conformal scanning antennas mounted on a cylinder. The main contribution is a reference list and the recommendation for combining asymptotic mutual coupling with gtd fuselage modeling for antenna pattern calculations. The important technique of beam shape modification at low scan angles through the use of modified surface impedance structures is also mentioned. (RRH)

DESCRIPTORS: (U) \*ANTENNA RADIATION PATTERNS, \*BEAM FORMING, \*CONFORMAL STRUCTURES, \*FUSELAGES, \*SCANNING, ANGLES, ANTENNAS, ARCHES, COMPUTATIONS, IMPEDANCE, LOW ANGLES, MODELS, MODIFICATION, STRUCTURES, SURFACES, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304D9.

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NEW YORK UNIV MEDICAL CENTER NY DEPT OF PSYCHIATRY

characteristic of the brain. (sdw)

(U) Computing with Neural Maps: Application to Perceptual and Cognitive Functions.

DESCRIPTIVE NOTE: Annual rept. 8 Jan 88-31 Jul 89,

OCT 89

PERSONAL AUTHORS: Schwartz, Eric

CONTRACT NO. AFOSR-88-0275

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR  
TR-89-1826

IDENTIFIERS: (U) PEB1102F, WJAFOSR2313A8.

DESCRIPTORS: (U) \*BRAIN, \*COGNITION, \*PATTERN RECOGNITION, \*PSYCHOPHYSIOLOGY, ACCURACY, ALGORITHMS, BIOLOGY, CYBERNETICS, DATA MANAGEMENT, EYE, FORMATS, FUNCTIONS, HIGH RATE, INPUT, MAPPING, MAPS, MONKEYS, NERVOUS SYSTEM, ORIENTATION(DIRECTION), PARAMETERS, PATTERNS, SENSES(PHYSIOLOGY), SPATIAL DISTRIBUTION, PERCEPTION(PSYCHOLOGY).

UNCLASSIFIED REPORT

ABSTRACT: (U) During the past year, we have completed two important steps in our program for understanding the biological and computational significance of patterns of spatial mapping in the brain. First, we have found a simple algorithm which is capable of describing and synthesizing the patterns of ocular dominance columns and orientation columns in the cat and monkey. This algorithm is controlled by a small number of parameters, and we show that it produces patterns which are similar to those in our lab, and elsewhere, obtained from animal experimentation. Moreover, we show that a number of previously published algorithms for similar purposes can be shown to be equivalent to our algorithm. The significance of this work is that we can now describe and synthesize some of the major architectural features of cat and monkey sensory cortex with high accuracy. In addition, we have obtained some insight into the essential simplicity of these patterns. This work is currently in press in Biological Cybernetics. In addition, we have developed an algorithm for pattern recognition based on the multiple, parallel two dimensional mapping of the input data. We view this as an important step in our goal of developing insight into the use of multiple, parallel sensory mappings in the brain. We believe that this algorithm is the first pattern recognition algorithm to make explicit use of the kind of data format which is

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AD-A216 687 11/2 11/9 7/6

STANFORD UNIV CA DEPT OF APPLIED PHYSICS

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MATERIALS  
SCIENCE AND ENGINEERING

(U) Superconducting Thin Films, Composites and Junctions.

(U) Ceramics Derived from Organo-Metallic Precursors and  
Microstructure of Amorphous Polymer.

DESCRIPTIVE NOTE: Interim rept. 1 Oct 84-31 Mar 85,

AUG 85

DESCRIPTIVE NOTE: Final rept.,

PERSONAL AUTHORS: Geballe, T. H.

JUL 85

CONTRACT NO. F49620-82-C-0014

PERSONAL AUTHORS: Uhlmann, Donald R.

PROJECT NO. 2306

CONTRACT NO. AFOSR-81-0011

TASK NO. C1

MONITOR: AFOSR

TR-89-1758

MONITOR: AFOSR  
TR-89-1758

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The important issue of how the superconducting transition temperature  $T(c)$  in disordered systems changes near the M-I transition where strong localization ( $k(F)$ ) approx. 1) as expected has been studied in the Mo-Ge system. In the high Mo concentration, which is in the weakly localized regime,  $T(c)$  decreases linearly with decreasing Mo concentration from 7.5 K (78 at.% Mo) at a rate of approx. 0.18 K/at.% Mo. In this region the ratio of electron-phonon coupling constant  $\gamma$  to the bare density of states  $N(b)(0)$  is constant, which is consistent with the Varma-Dynes tight-binding model. An extrapolation of the linear behavior of  $T(c)$  in this regime yields the disappearance of  $T(c)$  near 35 at.% Mo. However, measurements show that  $T(c)$  exists down to 13.5 at.% Mo. A non-superconducting metallic phase is found to exist between 13.5 at 10.4 at.% Mo at which concentration the insulated phase occurs. (rrh)

DESCRIPTORS: (U) \*SUPERCONDUCTORS, COUPLING(INTERACTION), DENSITY, ELECTRONS, INSULATION, ORDER DISORDER TRANSFORMATIONS, PHONONS, RATIOS, THIN FILMS, YIELD.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306C1.

AD-A216 688

ABSTRACT: (U) This work represented a continuation of our efforts directed to understanding the microstructure of epoxy resin cured with amine hardeners. The focus has been on characterizing a series of networks formed by changing the formulations and the processing conditions of the system. The table on pages shows the Epon 828 epoxy/triethylene tetramine (TETA) formulations which were explored, together with the curing conditions employed. Ceramics from Organo-metallic Precursors: Our investigations of the conversions of organo-metallic precursors to ceramics have directed attention to five principal areas. These were: 1) Investigation of hydrolysis and condensation kinetics of tetraethyloxosilicate (TEOS); 2) Exploration of the for many glasses and ceramics; 3) Exploration of the competition between crystallization and viscous sintering to determine the conditions under which dense glassy bodies of coatings can be obtained; 3) Investigation of the hydrolysis and condensation of tantalum ethoxide to form coatings of tantalum oxide; 4) Initial exploration of organic modified as novel coatings and bulk materials; and 5) Exploration of the conversion of aluminum alkoxides most notable aluminum sec butoxide, to aluminum oxide. Progress in the first two of these areas will be described in the present report; progress in the last three will be deferred to a later date. (AW)

DESCRIPTORS: (U) \*AMORPHOUS MATERIALS, \*CERAMIC MATERIALS, \*ORGANOMETALLIC COMPOUNDS, \*POLYMERS, ALKOXY

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RADICALS, ALUMINUM, ALUMINUM OXIDES, AMINES, BULK MATERIALS, COATINGS, CONDENSATION, CRYSTALLIZATION, CURING, EPOXY RESINS, GLASS, HARDENING, HIGH DENSITY, HYDROLYSIS, KINETICS, MICROSTRUCTURE, NETWORKS, OXIDES, PRECURSORS, PROCESSING, SINTERING, TANTALUM, VISCOSITY.

NORTH CAROLINA UNIV AT CHARLOTTE DEPT OF MATHEMATICS  
(U) Probabilistic Models and Statistical Inference in Reliability and Replacement Policies.

DESCRIPTIVE NOTE: Final rept..

IDENTIFIERS: (U) PE61102F.

80

PERSONAL AUTHORS: Abdel-Hameed, Mohamed

CONTRACT NO. F49620-79-C-0093

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-1805

UNCLASSIFIED REPORT

ABSTRACT: (U) Contents: Optimal Inspection Policy for a Deteriorating Device; Some Multivariate Life Distributions. (kr)

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*PROBABILITY, \*STATISTICAL INFERENCE, INSPECTION, MULTIVARIATE ANALYSIS, OPTIMIZATION, POLICIES, RELIABILITY, REPLACEMENT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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TEXAS A AND M UNIV COLLEGE STATION TURBOMACHINERY LABS

VOLUME.

(U) Rotordynamic Forces Developed by Labyrinth Seals. IDENTIFIERS: (U) PEG1102F, WUAFOSR2307B1.

DESCRIPTIVE NOTE: Final rept.,

NOV 84

PERSONAL AUTHORS: Morrison, Gerald L.

CONTRACT NO. AFOSR-83-0259

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-89-1771

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The basic laser anemometer system purchased was not the five beam system described in the proposal. The system purchased was recommended by TSI Inc. after the funding was obtained. This system is substantially better than the one originally proposed since it uses three colors for each of the three velocity components instead of two colors and frequency shift. Figure 1 is a schematic of the acquired system. The three color system allows the measurement range of the vertical and on-axis velocity components to be doubled. In addition, the acquired system uses 30 deg off axis back scatter to collect the doppler signal. This results in a better signal to noise ratio in the photomultiplier output and also yields better spatial filtering by the optic system. The intersection of the three different color measurement volumes was reduced in size using this new system. This was especially important for the measurements inside the labyrinth seals. Attached is a listing of the various parts purchased for both the laser anemometer system and for the computer system dedicated to the laser system. (kr)

**DESCRIPTORS:** (U) \*LABYRINTH SEALS, AXES, COLORS, COMPUTERS, DOPPLER EFFECT, FREQUENCY SHIFT, LASER ANEMOMETERS, LASERS, MEASUREMENT, OPTICAL EQUIPMENT, OUTPUT, PHOTOMULTIPLIER TUBES, SIGNAL PROCESSING, SIGNAL TO NOISE RATIO, SPATIAL FILTERING, VERTICAL ORIENTATION,

AD-A216 882

AD-A216 682

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 681 7/4 20/12 20/2

AD-A216 670 12/5

CALIFORNIA UNIV BERKELEY

STANFORD UNIV CA DEPT OF COMPUTER SCIENCE

(U) International Conference on the Structure of Surfaces (ICSOS-1) (1st) Held in Berkeley, California on August 13-16, 1984.

(U) Deductive Computer Programming.

DESCRIPTIVE NOTE: Final technical rept. 1 Mar 87-28 Feb 88.

DESCRIPTIVE NOTE: Final rept.

FEB 88

AUG 84

PERSONAL AUTHORS: Manna, Zohar

CONTRACT NO. AFOSR-ISSA-84-0078

CONTRACT NO. AFOSR-87-0149

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. A2

TASK NO. A2

MONITOR: AFOSR  
TR-89-1770MONITOR: AFOSR  
TR-89-0570

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*SURFACE CHEMISTRY, \*MOLECULAR STRUCTURE, SEMICONDUCTORS, PARTICLE COLLISIONS, SPECTROSCOPY, MOLECULAR PROPERTIES, ADSORPTION, LAYERS, THIN FILMS, CHEMISORPTION, CRYSTAL DEFECTS, ORDER DISORDER TRANSFORMATIONS, INELASTIC SCATTERING, ELECTRON SCATTERING, EPITAXIAL GROWTH, INSULATION, ATOMS, ADSORBATES, MOLECULE MOLECULE INTERACTIONS, METALS, INTERFACES, SYMPOSIA, CALIFORNIA, INTERNATIONAL, SYMPOSIA.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2, U/A Reports.

ABSTRACT: (U) It is generally agreed that providing a precise formal semantics for a programming language is helpful in fully understanding the language. This is especially true in the case of logic programming like languages for which the underlying logic provides a well-defined but insufficient semantic basis. Indeed, in addition to the usual model theoretic semantics of the logic, proof, theoretic deduction plays a crucial role in understanding logic programs. Moreover, for specific implementations of logic programming, e.g. PROLOG, the notion of deduction strategy is also important. Computer program languages. (kt)

DESCRIPTORS: (U) \*COMPUTER LOGIC, COMPUTER PROGRAMMING, COMPUTER PROGRAMS, LOGIC, MODELS, PROGRAMMING LANGUAGES, SEMANTICS, THEORY.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A2.

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REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 664 12/9

AD-A216 664 CONTINUED

CALSPAN UB RESEARCH CENTER BUFFALO N.Y.

COMPUTER PROGRAMS, COMPUTERS, HUMANS, INTERFACES,  
LEARNING, LINGUISTICS, NATURAL LANGUAGE, SPEECH  
RECOGNITION, TARGETS, USER NEEDS, WORDS(LANGUAGE).

(U) Knowledge-Based Extensible Natural Language Interface  
Technology Program.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A7.

DESCRIPTIVE NOTE: Final rept. Feb 88-Sep 89.

NOV 89

PERSONAL AUTHORS: Neal, Jeannette G.

CONTRACT NO. F49620-88-C-0050

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-89-1752

UNCLASSIFIED REPORT

ABSTRACT: (U) This research project addressed the problem of developing knowledge-based natural language interface technology that is extensible via natural dialogue between user and computer system. Natural language understanding systems need to be extensible to accommodate changes in the target application system to which they interface as well as to accommodate new users. Typically, however, current systems cannot be extended as part of a normal dialogue session. Instead, extensions must be incorporated and compiled into the interface off line before the interface is loaded for use. This can be costly in terms of down-time and frustrating for the new user. The solution that was pursued in this project was to develop a natural language interface system, called Lydia, that is extensible via methods that are modeled after human behavior. Specifically, the following methods were implemented in the Lydia system: a) learning by being told including the ability to understand natural language when it is used as its own meta-language to explain new concepts, relation, and rules and b) being able to infer the category and attributes of new words from their linguistic context when used in a natural language sentence. Keywords: Expert system; Speech recognition. Computer programs; Man computer interface. (KT)

DESCRIPTORS: (U) \*MAN COMPUTER INTERFACE, BEHAVIOR

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

AD-A216 662 20/5

AD-A216 629 20/4

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF AERONAUTICS  
AND ASTRONAUTICS

(U) Surface Intermediates in Thin Film Deposition on  
Silicon.

DESCRIPTIVE NOTE: Final rept. 15 Nov 85-14 Nov 88.

DESCRIPTIVE NOTE: Final rept. Sep 87-Oct 89.

AUG 89

DEC 89

PERSONAL AUTHORS: Benziger, Jay B.

PERSONAL AUTHORS: Dugundji, J.; Epstein, A. H.; Greitzer,  
E. M.; Guenette, G. R.; Valavani, L.

CONTRACT NO. AFOSR-86-0050

CONTRACT NO. AFOSR-87-0398

PROJECT NO. 2303

PROJECT NO. 2307

TASK NO. A2

TASK NO. A4

MONITOR: AFOSR  
TR-89-1754

MONITOR: AFOSR  
TR-89-1878

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This project examined the fundamental processes of surface reactions using infrared spectroscopy. The novelty of this project was the development of a dynamic infrared spectroscopic technique capable of following reaction dynamics on well defined single crystal surfaces. The dynamic infrared technique was applied to two experiments. The first experiment was used to follow single shot experiments; the technique was used to follow thermally induced reactions using temperature programmed reflection absorption infrared spectroscopy (TPRAIS). The second experiment is to follow dynamics of repetitive processes combining modulated molecular beams with reflection infrared. This has been demonstrated for simple adsorption desorption of CO on Pt; difficulties in achieving proper conditions for film growth have precluded the application to film deposition, but we are continuing to pursue this problem. (jhd)

DESCRIPTORS: (U) \*DEPOSITION, \*INFRARED SPECTROSCOPY,  
\*SURFACE CHEMISTRY, \*THIN FILMS, ADSORPTION, DESORPTION,  
DYNAMICS, HEAT, MODULATION, MOLECULAR BEAMS, REFLECTION,  
RESPONSE, SILICON, SINGLE CRYSTALS, SURFACE REACTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2.

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ABSTRACT: (U) Three separate sections are included. The first is a brief review of the work done on active control of rotating stall under this contract. The second is a paper on the existence of precursor travelling waves in compressor annuli and on some of the signal processing techniques used to examine such waves. The third section is a paper describing first-of-a-kind (as far as we are aware) experiments in which tailored system structural properties have been used to suppress compression system aerodynamic instability (surge). Keywords: Active control; Compression system flow instabilities; Unsteady flow; Fluid structure interaction. (jhd)

DESCRIPTORS: (U) \*FLIGHT CONTROL SYSTEMS, \*STALLING,  
\*TRAVELLING WAVES, \*UNSTEADY FLOW, AEROYNAMIC LOADING,  
AERODYNAMICS, COMPRESSION, FLUIDS, INTERACTIONS,  
MECHANICS, PRECURSORS, ROTATION, SIGNAL PROCESSING,  
STABILITY, STABILIZATION, STRUCTURAL PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A4.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

AD-A216 628 20/4

AD-A216 623 20/5

WASHINGTON UNIV SEATTLE DEPT OF AERONAUTICS AND  
ASTRONAUTICS

STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Turbulence Structure of Mixing Swirling Flows.

(U) Dynamics of an M-Level Atom Interacting with Cavity  
Fields. 2. Properties of Photon Statistics.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 85-30 Sep  
89.

NOV 89

DEC 89

PERSONAL AUTHORS: Li, Fu-Li; Li, Xiao-Shen; Lin, D. L.;  
George, Thomas F.

PERSONAL AUTHORS: Gessner, Fredrick B.

CONTRACT NO. F49620-86-C-0009

CONTRACT NO. AFOSR-85-0273

PROJECT NO. 2303

PROJECT NO. 2307

TASK NO. B3

TASK NO. A4

MONITOR: AFOSR  
TR-89-1886

MONITOR: AFOSR  
TR-89-1877

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v40 n9  
p5129-5134, 1 Nov 89.

ABSTRACT: (U) This study is an experimental investigation of a swirling inner flow which develops along a constant-diameter centerbody in the presence of an unconfined, axially-directed outer flow. The data which have been acquired include local mean velocity and static pressure profiles at six streamwise locations for different prescribed mass flow rate ratios. Local wall shear stress measurements were made at these six streamwise locations in order to investigate local law-of-the-wall behavior in the vicinity of the centerbody. Reynolds stress measurements were also made in order to quantify the local turbulence structure. This report describes the scope of these measurements and the physical characteristics of the flow which have been deduced from the data. The implications of the results from a turbulence modeling point of view is also discussed. Keywords: Turbulent flows. (kr)

DESCRIPTORS: (U) \*TURBULENT FLOW, FLOW, INTERNAL, MEAN, MEASUREMENT, MIXING, MODELS, MOMENTUM TRANSFER, PHYSICAL PROPERTIES, POSITION(LOCATION), PROFILES, STATIC PRESSURE, STRESSES, TURBULENCE, VELOCITY.

IDENTIFIERS: (U) PE81102F, WUAFOSR2307A4, \*Swirling flow.

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ABSTRACT: (U) For a system of an M-level atom interacting with cavity fields, the statistical properties of the field are investigated numerically. The variation of photon antibunching and probability distribution with the atomic level number and initial field intensity is discussed for both resonance and off-resonance cases. Reprints. (jhd)

DESCRIPTORS: (U) \*ATOMIC ENERGY LEVELS, \*ENERGY TRANSFER, \*PHOTONS, ATOMIC PROPERTIES, CAVITIES, FIELD INTENSITY, PROBABILITY DISTRIBUTION FUNCTIONS, REPRINTS, STATISTICS, RESONANCE, VARIATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 622 11/10 11/4 20/11

AD-A216 622 CONTINUED

JOHNS HOPKINS UNIV BALTIMORE MD

(U) High Temperature Modulus and Structure of Poly (P-Phenylene Benzobisthiazole) Fibers,

89

PERSONAL AUTHORS: Jiang, H.; Eby, R. K.; Adams, W. W.

CONTRACT NO. AFOSR-87-0320

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-1892

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in High Technology Polymer '89, ed. A: Nakajima, v207 p207-211 1989.

**ABSTRACT:** (U) A high modulus and high-temperature properties are of great importance for fibers used in aerospace composites. We have developed a method which uses laser-generated ultrasound to measure the Young's modulus of fibers as a function of temperature and static tensile stress. For fibers of poly (p-phenylene benzobisthiazole), measurements have been made to 580C and 1.7 GPa. They exhibit nonlinear elasticity which changes systematically with temperature, tensile stress and processing conditions. They exhibit a relaxation associated with a structure change at about 300-400C. We have also used x-ray diffraction to measure aspects of the ultrastructure such as crystal orientation, crystal size and unit cell. The measurement of the unit cell dimensions as a function of temperature to 500C shows a structure change at about 300-400C. It is consistent with an oscillation of the phenyl and bisthiazole moieties around the connecting single bonds. Keywords: Rigid rod; Polymers; Reprints.

**DESCRIPTORS:** (U) \*COMPOSITE MATERIALS, \*FIBERS, \*POLYMERS, \*MODULUS OF ELASTICITY, \*CRYSTAL STRUCTURE, \*THERMAL STABILITY, AEROSPACE SYSTEMS, CHEMICAL BONDS, CELLS, CRYSTALS, ELASTIC PROPERTIES, HIGH TEMPERATURE, LASERS, NONLINEAR SYSTEMS, ORIENTATION(DIRECTION).

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OSCILLATION, PHENOLS, PROCESSING, REPRINTS, RIGIDITY, RODS, SIZES(DIMENSIONS), STATICS, TENSILE STRESS, ULTRASONICS, X RAY DIFFRACTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Polyphenylene Benzobisthiazoles, Poly(P-Phenylene Benzobisthiazole), Ultrastructure, Unit Cells, Rigid Rod Polymers, Youngs Modulus.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVJ20M

AD-A216 611

20/6

AD-A216 586

11/9

STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Photochemistry at Corrugated Thin Metal Films: A Phenomenological Approach.

89

PERSONAL AUTHORS: Leung, P. T.; Kim, Y. S.; George, Thomas F.

REPORT NO. 1:0

CONTRACT NO. F49620-86-C-0009

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-1698

UNCLASSIFIED REPORT

ABSTRACT: (U) A phenomenological model is adopted to explore possible novel photochemical phenomena for molecules in the vicinity of a corrugated thin metal film, with detailed results worked out for the photoabsorption cross section for molecules in the vicinity of a grating film. A mechanism is proposed by which enhanced selective photoabsorption may be achieved based on the different nature of the coupling of the molecular dipole and the incident laser light to the surface plasmon modes of the thin films. (rrh)

DESCRIPTORS: (U) \*ABSORPTION, \*CROSS SECTIONS, \*GRATINGS(SPECTRA), \*LASER BEAMS, \*METAL FILMS, \*PHOTOCHEMICAL REACTIONS, \*PLASMONS, \*SURFACES, \*THIN FILMS, CORRUGATING, FILMS, LIGHT, MOLECULES.

IDENTIFIERS: (U) PE01102F, WUAFOSR230383.

AD-A216 611

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PAGE 2 of 2

E. J. ZOM

CAMBRIDGE UNIV (UNITED KINGDOM) DEPT OF METALLURGY AND MATERIALS SCIENCE

(U) Local Structure of Network Resins.

DESCRIPTIVE NOTE: Final rept. 15 May 87-14 May 89.

NOV 89

PERSONAL AUTHORS: Windle, A. H.; Lovell, R.

CONTRACT NO. AFOSR-87-0220

PROJECT NO. 6101, 2303

TASK NO. 00, A3

MONITOR: AFOSR  
TR-89-1887

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of the project is to understand the local molecular organization in epoxy resin systems, and thus to establish a bridgehead in relating chemical composition to final properties. The approach has been two-pronged. The local molecular structure of the cross-linked system has been modelled using advanced computer simulation systems which provide a prediction based on available chemical knowledge. A parallel experimental programme has been established in which wide angle X-Ray diffraction is measured from both oriented and unoriented samples. The experimental data are compared with diffraction patterns calculated from the computer generated molecular model. The conformational flexibility has been calculated for a range of differently substituted variants of bis-phenyl A, and these units incorporated into simple models of the molecular network. (rrh)

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*CROSSLINKING(CHEMISTRY), \*EPOXY RESINS, \*MODELS, \*MOLECULAR STRUCTURE, \*NETWORKS, CHEMICAL COMPOSITION, COMPUTERS, DIFFRACTION, EXPERIMENTAL DATA, MOLECULES, ORGANIZATIONS, PATTERNS, POLYMERS, WIDE ANGLES, X RAY DIFFRACTION.

IDENTIFIERS: (U) PES1101F, WUAFOSR610100, WUAFOSR2303A3.

AD-A216 586



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 578 5/8

AD-A216 562 12/1

MASSACHUSETTS UNIV AMHERST DEPT OF PSYCHOLOGY

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Biological Investigations of Adaptive Networks:  
Neuronal Control of Conditioned Responding.

(U) Critical Slowing Down, Phase Relations, and  
Dissipation in Driven Oscillatory Systems.

DESCRIPTIVE NOTE: Final rept. 1 May-1 Nov 84.

89

NOV 84

PERSONAL AUTHORS: Tsarouhas, George E.; Ross, John

PERSONAL AUTHORS: Moore, John W.

CONTRACT NO. AFOSR-87-0120

CONTRACT NO. AFOSR-83-0215

PROJECT NO. 2303

PROJECT NO. 2312

TASK NO. B1

TASK NO. A1

MONITOR: AFOSR  
TR-89-1763

MONITOR: AFOSR

TR-89-1851

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v93 n7 p2833-2836 1989.

ABSTRACT: (U) This algorithm was originally developed by John E. Desmond. With additional work by Neil Berthier and with advice from Rich Sutton, this model has been rendered into a form that can make predictions about CR topography and the firing pattern of neurons related to the CR. The original version of the model could do this reasonably well for the case of a single CS paired with the US in a forward-delay paradigm. The model has now been generalized so that it can predict CR topography (or simply associative strength) and single-unit physiological data within complex training paradigms that involve two CSs with independent on-and-off-times with respect to each other and the US. Keywords: Psychology; Neural response; Learning behavior. (JES)

DESCRIPTORS: (U) \*BEHAVIOR, \*PSYCHOLOGY, ADAPTIVE SYSTEMS, ALGORITHMS, ASSOCIATIVE PROCESSING, BIOLOGY, CONTROL, LEARNING, MODELS, NERVE CELLS, NERVOUS SYSTEM, NETWORKS, PATTERNS, RESPONSE, STRENGTH(GENERAL), TOPOGRAPHY, TRAINING, ADAPTIVE TRAINING.

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A1.

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ABSTRACT: (U) Three dynamical properties of forced nonlinear systems are discussed with approximate analytic solutions obtained from the dynamic equations for oscillatory systems, near a supercritical Hopf bifurcation, driven by periodic perturbations of small amplitude. With these solutions we first obtain the phase difference between the response of the system and the periodic perturbation and its dependence on the parameters, and hence the mechanism, of the system. Second, we derive expressions for critical slowing down near edges of entrainment bands, with consideration of possible variation of both the radius and phase of the perturbed limit cycle with the amplitude of perturbation. Third, we show by analysis the previously numerically calculated variation of the dissipation within entrainment bands, which depends linearly on the square of the amplitude of the response of the perturbed system. Reprints. (rrh)

DESCRIPTORS: (U) \*MATHEMATICAL ANALYSIS, AMPLITUDE, BANDS(STRIPS), CYCLES, DISSIPATION, DYNAMICS, EDGES, ENTRAINMENT, EQUATIONS, LIMITATIONS, NONLINEAR SYSTEMS, OSCILLATION, PERTURBATIONS, REPRINTS, RESPONSE, VARIATIONS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 562 CONTINUED

AD-A216 561 7/4

IDENTIFIERS: (U) PEB1102F, WUAFOSR230381.

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Thermodynamics of Chemical Systems Far from  
Equilibrium,

89

PERSONAL AUTHORS: Ross, John; Garcia-Colin, Leopoldo S.

CONTRACT NO. AFOSR-87-0120

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1762

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v93 n5 p2091-2092 1989.

ABSTRACT: (U) A critique is presented of some recent  
work in this and other journals on the relation of  
thermodynamics to the mass action law of kinetics. For  
most chemical reactions, the thermodynamic variables  
change on the same time scale as the progress variable  
and there is no need for an 'extended thermodynamics'.  
Reprints. (av)

DESCRIPTORS: (U) \*THERMOCHEMISTRY, \*REACTION KINETICS,  
CHEMICAL REACTIONS, MASS, REPRINTS, SCALE, THERMODYNAMICS,  
TIME, VARIABLES.

IDENTIFIERS: (U) PEB1102F, WUAFOSR230381.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 560 CONTINUED

AD-A216 560 21/2 7/4

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Spectral Kinetics: Study of Complex Reactions by  
External Perturbations.  
IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B1.

88

PERSONAL AUTHORS: Ross, John

CONTRACT NO. AFOSR-87-0120

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1761

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Reactivity in  
Liquids, p455-458 1988.

ABSTRACT: (U) The study of the response of nonlinear systems to external periodic perturbations leads to interesting information. Cool-flame oscillations occur in a number of combustion reactions, and an experimental study is discussed of the effect of external periodic perturbations to a chemical reaction can reveal important information about the stability, kinetics, and dynamics of the reaction. This technique is well known in the field of relaxation kinetics, in which perturbations are applied to a chemical system at equilibrium. In this work, periodic perturbations are first applied to the input rates of acetaldehyde in a CSTR. We measure periodic responses in five entrainment bands as we vary the frequency and amplitude of the external periodic perturbation. Outside of entrainment bands we find quasi-periodic responses. Next-phase maps of the experimental results are constructed in real time and used in the observation and interpretation of entrainment and quasi-periodic behavior. Reprints. (jhd)

DESCRIPTORS: (U) \*ACETALDEHYDE, \*CHEMICAL REACTIONS, \*FLAMES, BANDS(STRIPS), COMBUSTION, DYNAMICS, ENTRAINMENT, CHEMICAL EQUILIBRIUM, EXTERNAL INPUT, REACTION KINETICS, NONLINEAR SYSTEMS, PERTURBATIONS, RATES, REAL TIME, RELAXATION, REPRINTS, RESPONSE, EMISSION SPECTRA.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

AD-A216 559 12/1

AD-A216 558 7/4 7/3

STANFORD UNIV CA DEPT OF CHEMISTRY

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Approximate Solutions of Nonlinear Systems Driven with Periodic Perturbations of Arbitrary Form,

89

PERSONAL AUTHORS: Tsarouhas, Georgios; Ross, John

PERSONAL AUTHORS: Myers, A. K.; Benziger, J. B.

CONTRACT NO. AFOSR-87-0120

CONTRACT NO. AFOSR-86-0050

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B1

TASK NO. A2

MONITOR: AFOSR  
TR-89-1760

MONITOR: AFOSR  
TR-89-1757

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n9 p3657-3659 1989.

SUPPLEMENTARY NOTE: Pub. in Langmuir, v5 p1270-1288 1989. Presented at the symposium on 'Metal-Catalyzed Reactions of Heteroatom-Containing Molecules', Division of Colloid and Surface Chemistry, National Meeting of the American Chemical Society (196th), Los Angeles, CA, Sept 25-30, 1988.

ABSTRACT: (U) Approximate analytical solutions are presented for a general two-variable nonlinear dynamical system, in the neighborhood of a stable node, a stable focus, or a limit cycle near a Hopf bifurcation, driven by periodic external perturbations of arbitrary form expressible by a Fourier series. The dynamic equations of the driven system are transformed to normal form, further reduced to those of a two-variable autonomous system, and solved to third order. Reprints. (jhd)

DESCRIPTORS: (U) \*PERTURBATION THEORY, \*SOLUTIONS(GENERAL), DYNAMICS, EQUATIONS, EXTERNAL, FOURIER SERIES, NODES, NONLINEAR SYSTEMS, REPRINTS, STABILITY.

IDENTIFIERS: (U) Hopf Bifurcation, PE81102F, WJAFOSR230381.

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ABSTRACT: (U) The adsorption and reaction of aniline, phenol, methoxybenzene, chlorobenzene, nitrosobenzene, nitrobenzene, and benzaldehyde were studied on Ni(111) groups to elucidate the role of substituent groups in adsorption and reaction of substituted benzenes. Temperature-programmed reaction (TPR) and reflection absorption infrared spectroscopy were used to characterize modes of bonding and reaction paths. The absorption bands were also modeled by using semiempirical intermediate neglect of differential overlap technique (INDO) with a 19 nickel atom cluster having the symmetry of the (111) surface. The nickel surface acted as an electron acceptor in electrophilic reactions with adsorbates. Chlorobenzene was found to adsorb flat, with the chlorine atom participating in the bond to the surface. With electron-withdrawing groups, the substituents were the site of chemical activity. The CN side group in benzonitrile rehybridized upon adsorption on Ni(111), resulting in a bonding configuration in which the phenyl ring was tilted away from the surface. Benzaldehyde also apparently interacts mainly through the

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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C=O bond of the CHO side group. NO bonds were particularly reactive. Nitrobenzene and nitrobenzene bonded dissociatively through their side group, and NO bond scission was very facile. Electron-donating groups activated the benzene for electrophilic addition reactions. Reprints. (AW)

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Is Triquinacene Homoaromatic? A Computational Study.  
89

PERSONAL AUTHORS: Devar, Michael J.; Holder, Andrew J.

DESCRIPTORS: (U) \*ADSORPTION, \*BENZENE, \*NICKEL, \*SURFACE REACTIONS, ABSORPTION, ABSORPTION SPECTRA, ADDITION REACTIONS, ALDEHYDES, ANILINES, ATOMS, CHEMICAL BENZONITRILES, BENZYL RADICALS, CHEMICAL BONDS, CHEMICAL REACTIONS, CHLORINE, CHLOROBENZENE, CONFIGURATIONS, ELECTRON ACCEPTORS, ELECTRONS, INFRARED SPECTROSCOPY, OVERLAP, PATHS, PHENOLS, REFLECTION, REPRINTS, RESPONSE, RINGS, SIDES, SITES, SPECTROSCOPY, SUBSTITUTES, SURFACES, METHYL RADICALS, OXYGEN, NITROBENZENES, NITROSO COMPOUNDS, HYBRIDIZATION, CLUSTERING, ELECTRON DONORS.

CONTRACT NO. AFOSR-88-0022

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1888

UNCLASSIFIED REPORT

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, Methoxybenzene, Nitrobenzene, Benzaldehyde, Electrophilic Reactions, INDO(Intermediate Neglect Of Differential Overlap).

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 n14 p5384-5387 1989.

ABSTRACT: (U) AM1, ab initio, and MM2 calculations indicate triquinacene shows no significant homoaromatic stabilization in contrast to conclusions drawn by Liebman, et al from thermochemical measurements. The discrepancy is attributed to the fact that the five-membered rings in di-, tetra-, and hexahydrotriquinacene are twisted and it can be accounted for quantitatively in this way. A discrepancy between a recent ab initio study by Miller et al and experiment is attributed to computational errors. Reprints. (AW)

DESCRIPTORS: (U) \*COMPUTATIONS, \*THERMOCHEMISTRY, \*CYCLIC COMPOUNDS, \*AROMATIC COMPOUNDS, ERRORS, MEASUREMENT, REPRINTS, ANALYTICAL CHEMISTRY, MOLECULAR STRUCTURE, QUANTITATIVE ANALYSIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Triquinacene, \*Homoaromatic Compounds.

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WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

(U) Panconnectivity of Locally Connected  $K(1,3)$ -Free Graphs.

(U) Finding Critical Independent Sets and Critical Vertex Subsets are Polynomial Problems.

DESCRIPTIVE NOTE: Final technical rept. Nov 88-Oct 89,

DESCRIPTIVE NOTE: Final technical rept. Nov 88-Oct 89,

OCT 89

OCT 89

PERSONAL AUTHORS: Zhang, Cun-Quan

PERSONAL AUTHORS: Zhang, Cun-Quan

CONTRACT NO. AFOSR-89-0068

CONTRACT NO. AFOSR-89-0068

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A8

TASK NO. A8

MONITOR: AFOSR  
TR-89-1866MONITOR: AFOSR  
TR-89-1864

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) A locally connected,  $K(1,3)$ -free graph is panconnected if and only if the graph is 3-connected.  
Keywords: Hamiltonian functions. (JHD)

ABSTRACT: (U) It has been proved by mathematicians that finding a maximum independent set in some certain kinds of graphs is solvable in polynomial time (for example, line graphs, bipartite graphs, circle graphs, circular arc graphs and claw free graphs. But it is well-known that it is an NP-complete problem for general graphs. In this paper, we will investigate another problem -- finding a certain kind of independent sets in general graphs. It will be proved in this paper that finding a critical independent set of a graph is solvable in polynomial time. (KR)

DESCRIPTORS: (U) \*GRAPHS, HAMILTONIAN FUNCTIONS.

IDENTIFIERS: (U) Connected Graphs, PE61102F,  
WUAFOSR2304A8.DESCRIPTORS: (U) \*GRAPHS, \*POLYNOMIALS, CIRCLES,  
MATHEMATICS, TIME, PROBLEM SOLVING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8.

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WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

TACAN CORP CARLSBAD CA

(U) Minimum Cycle Covering and Integer Flows.

(U) Nonlinear Optical Interactions in Semiconductors.

DESCRIPTIVE NOTE: Final technical rept. Nov 88-Oct 88,

DESCRIPTIVE NOTE: Final rept. 10 Aug 83-10 Feb 84,

OCT 89

MAR 84

PERSONAL AUTHORS: Zhang, Cun-Quan

PERSONAL AUTHORS: Salour, Michael M.

CONTRACT NO. AFOSR-89-0068

CONTRACT NO. F49620-83-C-0147

PROJECT NO. 2304

PROJECT NO. 2308

TASK NO. A8

TASK NO. C2

MONITOR: AFOSR  
TR-89-1865MONITOR: AFOSR  
TR-89-1775

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) It was conjectured by Fan that if a graph  $G = (V, E)$  has a nowhere-zero 3-flow, then  $G$  can be covered by two even subgraphs of total size at most  $|V| + |E| - 3$ . This conjecture is proved in this paper. It is also proved in this paper that the optimum solution of the Chinese Postman problem and the solution of minimum cycle covering problem are equivalent for any graph admitting a nowhere-zero 4-flow. (KR)

DESCRIPTORS: (U) \*FLOW, \*GRAPHS, NUMBERS, OPTIMIZATION, SOLUTIONS(GENERAL).

IDENTIFIERS: (U) FEB1102F, WUAFOSR22304A8.

ABSTRACT: (U) Studies of multiphoton optical pumping in semiconductors are continuing in narrow gap semiconductors and in GaAs. Our attempts are focused on observing a number of new optical effects including nonlinear absorption and transmission phenomena, enhanced spontaneous and stimulated light scattering processes, etc. The construction of an external ring cavity is currently near completion. This will allow us to undertake a careful study of multiphoton optical pumping in semi-conductors to generate IR radiation and a variety of studies involving narrow gap semiconducting compounds outlined in our proposal. We have studied the feasibility of room temperature operation of a tunable coherent source involving multiple quantum well material. An invention disclosure has been filed with the U.S. Air Force Patent Office for work performed on multiple quantum well material under this contract. We have also studied the absorption properties of a semiconductor under optical pumping with a white light source. (rrh)

DESCRIPTORS: (U) \*ABSORPTION, \*INTERACTIONS, \*LIGHT SCATTERING, \*NARROW GAP SEMICONDUCTORS, \*NONLINEAR SYSTEMS, \*OPTICAL PUMPING, \*PHOTONS, \*QUANTUM THEORY, \*WHITE LIGHT, CAVITIES, COHERENCE, EXTERNAL, INVENTIONS, LIGHT SOURCES, MATERIALS, OPERATION, OPTICAL PROPERTIES, PATENT OFFICE, RINGS, ROOM TEMPERATURE, SEMICONDUCTORS, SOURCES, STIMULATION(GENERAL), TRANSMITTANCE, TUNING.

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TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Anionic Substitution at Carbonyl Carbon. Implications  
for the Chemistry of Ions in Solution.

IDENTIFIERS: (U) PEG1102F, WUAFQSR230382, Ab Initio  
Calculations, AM1 Calculations, Desolvation.

89

PERSONAL AUTHORS: Dewar, Michael J.; Storch, Donn M.

CONTRACT NO. AFOSR-86-0022

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-1889

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Royal Society of Chemistry  
Jnl. Perkins Transactions 2, p877-225 1989.

ABSTRACT: (U) AM1 calculations are reported for the  
reactions of seven anions ( $\text{HO}^-$ ),  $\text{MeO}^-$ ,  $\text{EtO}^-$ ,  $\text{NH}_2^-$ ,  
 $\text{MeNH}^-$ ,  $\text{OCH}_2\text{NH}^-$ ,  $\text{H}^-$ ) with eight carboxylic  
derivatives (formic acid, the methyl esters of formic,  
acetic, fluoroacetic, difluoroacetic, and trifluoroacetic  
acids, formamide, and N-methylformamide) and formaldehyde.  
All were predicted to involve exothermic addition to the  
carbonyl group without activation, to form tetrahedral  
adducts, in agreement with our earlier work and recent ab  
initio calculations. The barriers to such reactions in  
solution are thus due entirely to the energy needed to  
desolvate the anion in order that the other reactant can  
approach. The nature and role of such desolvation  
barriers are discussed, with special reference to the  
hard-soft-acid-base theory and the mechanisms of enzyme  
reactions. Reprints. (AM)

DESCRIPTORS: (U) \*ANIONS, \*SUBSTITUTION REACTIONS  
\*CARBONYL COMPOUNDS, ACTIVATION, ADDITION REACTIONS,  
CHEMISTRY, ENZYMES, ESTERS, EXOTHERMIC REACTIONS,  
FORMALDEHYDE, FORMIC ACID, IONS, METHYL RADICALS,  
REPRINTS, OXYGEN, HYDROGEN, ETHYL RADICALS, AMINES,  
ACETIC ACID, FLUORINE COMPOUNDS, FORMAMIDES,  
BASES(CHEMISTRY), SOLVATION, COMPUTATIONS, QUANTUM  
CHEMISTRY.

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TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

JOHNS HOPKINS UNIV BALTIMORE MD

(U) A Critique of Frontier Orbital Theory,

(U) Nonlinear Elasticity of Carbon Fibers,

88

88

PERSONAL AUTHORS: Dewar, Michael J.

PERSONAL AUTHORS: Arsenovic, P.; Jiang, H.; Eby, R. K.;  
Adams, W. W.; Liu, John M.

CONTRACT NO. AFOSR-89-0179

CONTRACT NO. AFOSR-87-0320

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. A3

MONITOR: AFOSR  
TR-89-1890MONITOR: AFOSR  
TR-89-1891

UNCLASSIFIED REPORT

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SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Structure  
(Theochem), v200 p301-323 1989.

SUPPLEMENTARY NOTE: Pub. in Carbon '88, p485-487 1988.

ABSTRACT: (U) The frontier molecular orbital theory has been widely adopted in recent years in the belief that it represents the best available qualitative/semiquantitative treatment of chemistry in terms of quantum theory. While the dubious nature of the approximation on which it is based has been recognized, its apparent success has been taken as sufficient justification. While it has also been recognized that it fails in certain cases, these have been regarded as rare consequences of special circumstances. The claim that FMO theory alone can account for the course of pericyclic reactions, if true, would certainly indicate its superiority to earlier theoretical treatments. However, no in-depth criticism of these claims has as yet been published. The purpose here is to provide such an analysis. Reprints. (sdw)

ABSTRACT: (U) We have developed a method which uses laser-generated ultrasound to measure the Young's modulus of fibers as a function of temperature and tensile stress. Carbon fibers made from pitch are shown to exhibit nonlinear elasticity which varies systematically with temperature, tensile stress and fiber processing conditions. The fibers exhibit an apparent relaxation at a temperature below 250 deg C. X-ray measurements show that improved crystal orientation with increased tensile stress contributes to the nonlinear elasticity. We also used x-rays to determine crystal modulus, size and perfection and carried out calculations of crystal modulus. The reorientation of the crystals under stress is shown to account for much, but not all, of the nonlinear elasticity. Keywords: Reprints. (kr)

DESCRIPTORS: (U) \*MOLECULAR ORBITALS, \*QUANTUM THEORY, CHEMISTRY, ORBITS, REPRINTS, THEORY, CHEMISTRY, MOLECULAR ORBITALS, ORBITS, QUANTUM THEORY, REPRINTS, THEORY.

DESCRIPTORS: (U) \*CARBON FIBERS, \*ELASTIC PROPERTIES, CRYSTALS, FIBERS, LASERS, MEASUREMENT, NONLINEAR SYSTEMS, ORIENTATION(DIRECTION), PROCESSING, RELAXATION, REPRINTS, TENSILE STRESS, ULTRASONICS, X RAYS.

IDENTIFIERS: (U) PE81102F, WUAFOSR230382.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3.

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HARVARD COLL CAMBRIDGE MASS PRESIDENT AND FELLOWS

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

(U) Collaborative Planning.

(U) Synthesis and Chemistry of Unsaturated Metal Nitrogen Compounds.

DESCRIPTIVE NOTE: Final rept. 17 Oct 88-16 Oct 89,

DESCRIPTIVE NOTE: Final rept. May 86-Nov 89,

DEC 89

DEC 89

PERSONAL AUTHORS: Grosz, Barbara J.; Sidner, Candace L.; Balkanski, Cecile

PERSONAL AUTHORS: Trogler, William C.

CONTRACT NO. AFOSR-89-0088

CONTRACT NO. AFOSR-86-0027

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A2

TASK NO. B2

MONITOR: AFOSR  
TR-89-1868MONITOR: AFOSR  
TR-89-1867

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Our milestones for this pilot project were to collect additional interaction records of planning by two agents, to analyze the actions and action relations in the data, to refine definitions of action relations to represent adequately the relationships occurring in the data, and to prepare a report summarizing the major findings from the analysis and presenting the new action relationships. We analyzed data from the following three sources: a construction task, a group planning meeting, and a simulated human-computer problem-solving dialogue. A description of this data, the results of the analysis, and the proposed new action relations are described in this report.

DESCRIPTORS: (U) \*INFORMATION THEORY, CONSTRUCTION, INTERACTIONS, PILOT STUDIES, PLANNING, RECORDS, SOURCES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A2, \*Knowledge representation.

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ABSTRACT: (U) Our synthesis of the reactive highly unsaturated dianionic reagent,  $\text{Li}(\text{Ph})\text{N}=\text{N}(\text{Ph})\text{Li}=1$ , has provided us with a general synthetic route to main group and early transition metal tetraazabutadiene complexes. The synthetic scheme is outlined in figure 1. For main group elements, such as silicon or Germanium we can prepare both linear and cyclic tetrazenes. For transition metals we generally isolate the cyclic tetrazene. In certain instances the intermediate complex formed by addition of 1 to a dihalocomplex precursor fragments to generate metal nitrene intermediates. This reactivity is illustrated by the reaction between 1 and  $\text{PdCl}_2(\text{PET}_3)_2$ , which produced the first example of a palladium cluster containing imido ligands. When 1 is added to  $\text{CuCl}_2(\text{phen})$  an extremely reactive Cu nitrene species  $\text{CuNPh}(\text{phen})$  is generated which dimerizes by insertion of the coordinated nitrene fragment into and ortho C-H bond of the phenanthroline ligand. The resulting complex exhibits an extremely short Cu-Cu bond length of 2.600(2) Å. Thus, we have developed a new reagent, 1, that permits the synthesis of a wide range of unsaturated metal nitrogen complexes. The method of synthesis used for 1 also provides a new method for N-N bond formation, by addition of a deprotonated amine to an organic azide. The latter chemistry is relevant to the synthesis of new energetic materials that contain unsaturated nitrogen linkages and

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the transition metal complexes generated are of current interest as precursors for new elemental nitrides. (aw)

DESCRIPTORS: (U) \*METAL COMPLEXES, \*SYNTHESIS(CHEMISTRY), \*ORGANIC NITROGEN COMPOUNDS, AZIDES, CHEMICAL AGENTS, CLUSTERING, CYCLIC COMPOUNDS, ENERGETIC PROPERTIES, FRAGMENTS, GERMANIUM, PALLADIUM, PRECURSORS, RANGE(EXTREMES), REACTIVITIES, SILICON, TETRAZENES, TRANSITION METALS, BUTADIENES, COPPER COMPOUNDS, LITHIUM COMPOUNDS, CHLORIDES, IMIDES, LIGANDS, PHENANTHRENES, AMINES, ADDITION REACTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, Unsaturated Compounds, Phenanthrolines, Nitrenes, Tetraazabutadienes.

AD-A216 549 11/2

CONNECTICUT UNIV STORRS DEPT OF PHYSICS

(U) Metallic Glasses: Investigation of the Electronic Structure and Its Relationship to Physical Properties.

DESCRIPTIVE NOTE: Final rept. 1 Oct 82-30 Sep 83,

NOV 83

PERSONAL AUTHORS: Hines, William A.

CONTRACT NO. AFOSR-80-0030

PROJECT NO. 2306

TASK NO. C3

MONITOR: AFOSR  
TR-89-1772

UNCLASSIFIED REPORT

ABSTRACT: (U) During the past decade, materials scientists and solid state physicists have devoted considerable research activity to amorphous materials such as magnetic glasses, amorphous semiconductors and amorphous metallic alloys. This is due to a combination of a desire for a re-examination of some fundamental concepts of solids as well as the possibility for a variety of technological applications. Our research effort has focused principally on the class of amorphous materials known as 'amorphous metallic alloys' or 'metallic glasses'; materials which possess all the properties normally associated with metals but are not spatially periodic. For the most part, we have studied metallic glass systems with the general form  $T_i(100-x)G(x)$ , where TM is a transition metal (or combination of transition metals) such as Ni, Pd, Pt, Fe or Co; and G is a high valence metalloid (or combination of metalloids) such as B, Nb, Si or P. (rrh)

DESCRIPTORS: (U) \*AMORPHOUS MATERIALS, \*ELECTRONICS, \*GLASS, \*METALLOID ALLOYS, \*METALLOIDS, \*SEMICONDUCTORS, \*TRANSITION METALS, ALLOYS, MAGNETIC PROPERTIES, MATERIALS, METALS, PHYSICAL PROPERTIES, PHYSICISTS, SCIENTISTS, SOLIDS, VALENCE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306C3.

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IDENTIFIERS: (U) PE61102F, WUAFORS2306CT.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF PHYSICS

(U) Electromagnetic Scattering Processes at Resonances and with Intense Fields.

DESCRIPTIVE NOTE: Final rept. 1 Feb 79-31 Jul 80.

JUN 81

PERSONAL AUTHORS: Hellwarth, Robert W.

CONTRACT NO. AFOSR-79-0098

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-1783

UNCLASSIFIED REPORT

ABSTRACT: (U) To be able to interpret and predict the nature of the electromagnetic radiation that is scattered by matter from a strong incident monochromatic wave whose frequency is at or near a resonance of the scattering medium. The problems attacked include those that arise in mode-locking, saturable adsorption, saturation spectroscopy, high-energy optical amplifiers, infrared-laser window failure, optical image and frequency converters, optical computers, and coherent optical adaptive techniques. (rrh)

DESCRIPTORS: (U) \*ADSORPTION, \*ELECTROMAGNETIC RADIATION, \*ELECTROMAGNETIC SCATTERING, \*FREQUENCY CONVERTERS, \*OPTICAL EQUIPMENT, \*SATURATION, ADAPTIVE SYSTEMS, AMPLIFIERS, COHERENCE, COMPUTERS, HIGH ENERGY, INTENSITY, METHODOLOGY, OPTICAL IMAGES, OPTICS, SCATTERING, SPECTROSCOPY.

IDENTIFIERS: (U) PE61102F, WUAFORS2301A1.

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RAYTHEON CO PORTSMOUTH R I

(U) Analytical/Experimental Investigation of Corpuscular Radiation Detectors.

DESCRIPTIVE NOTE: Status rept. 1 May-30 Jun 85,

JUN 85

PERSONAL AUTHORS: Grossi, M. D.

CONTRACT NO. F49620-85-C-0030, \$AFOSR-85-0727

PROJECT NO. 2309

TASK NO. A1

MONITOR: AFOSR  
TR-89-1726

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: Also sponsored in part by DARPA Order-5271.

ABSTRACT: (U) During the report period several efforts were initiated both at Submarine Signal Division, Portsmouth Lab, and at the subcontractors. Dr. D. Bramanti, visiting scientist at SAO from Florence, Italy, arrived in early June and started working on June 6, 1985 in Cambridge, MA. A draft of the SAO Subcontract was reviewed and is now under negotiation. Work at SAO has already started, on the basis of a written commitment sent to them by Raytheon, and under financial coverage by the Smithsonian Institution, Washington, DC, while waiting for the full execution of the contract. Also, Prof. R. R. Lewis, the second Raytheon Subcontractor, started his work for the project, based on a written commitment by Raytheon, while formal award of the subcontract is underway. At Raytheon, work concentrated in program planning, and in the performance of such tasks as the definition of the signal processing approach to be used in connection with the field observations to be performed at the end of the contract, and the preliminary design of the instrumentation system. At SAO Dr. Bramanti started the analysis of the magnetic approach. Prof.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

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OREGON UNIV EUGENE DEPT OF PSYCHOLOGY

(U) Visual Processing in Texture Segregation.

DESCRIPTIVE NOTE: Annual rept. 1 Sep 88-30 Sep 89.

NOV 89

PERSONAL AUTHORS: Beck, Jacob

CONTRACT NO. AFOSR-88-0323

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-1780

UNCLASSIFIED REPORT

ABSTRACT: (U) Beck (1988) reported that the outputs of 2 D Gabor filters can account for much of the segregation of a periodic visual display (tripartite pattern) into regions. We have conducted a series of experiments showing that grouping processes, as well as the outputs of spatial-frequency/orientation channels, yield automatic spontaneous segregation. In our tripartite patterns, the arrangement of local properties is different in different regions so that if the display is suitably filtered by convolving the appropriate property at each point, or by performing some equivalent filtering process in the Fourier domain, the regions in the filtered display differ in different regions. We have shown that this type of computation is not able to account for the spontaneous segregation of a line in a display of disconnected shapes. A striking finding reported by Beck (1988) was that squares differing by a large lightness difference sometimes failed to give region segregation in a tripartite pattern while the same pattern of squares differing by a smaller lightness differences yielded strong region segregation. (kr)

DESCRIPTORS: (U) \*OPTICAL FILTERS, \*IMAGE PROCESSING, \*TEXTURE, \*VISUAL PERCEPTION, AUTOMATIC, COMPUTATIONS, DISPLAY SYSTEMS, FOURIER ANALYSIS, REGIONS, VISUAL AIDS, YIELD.

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STATE UNIV OF NEW YORK AT BUFFALO RESEARCH FOUNDATION

(U) Fundamental Studies of Surface Processes and Trace Analysis Using Solid Electrodes.

DESCRIPTIVE NOTE: Final rept. 1 Nov 86-31 Jul 88,

NOV 89

PERSONAL AUTHORS: Bruckenstein, Stanley

CONTRACT NO. AFOSR-87-0037

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-88-1779

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Physical electrochemical and electroanalytical studies were undertaken at silver, gold, and platinum electrodes. Underpotential deposition (UPD) studies were undertaken at polycrystalline silver electrodes. Using the electrochemical quartz crystal microbalance, it was shown that Pb(II) species are adsorbed at silver when the Pb(II) exists as an anion in solution. The anionic Pb(II) adsorbate is ultimately reduced to a underpotential Pb(O) with concomitant anion (ligand) expulsion from the electrode surface. Adsorption of sulfide ion (UPD without faradaic charge transfer) also occurs at silver from alkaline sulfide solutions. Three distinct UPD states were identified. The coulostatic formation of UPD Hg(O) at a gold electrode was studied in sulfuric acid using the EQCM. It was found that a monolayer of Hg(O) is formed along with an overlayer of mercury (I) bisulfate. The formation of silver sulfide during the electrooxidation of thioacetamide was established. A theoretical analysis of cathodic stripping peaks based on a hemispherical model with progressive nucleation was performed. The results were used in interpreting inductions times associated with the formation of cathodic stripping peaks at silver electrodes. The uncompensated ohmic potential drop at microelectrodes under steady state diffusion conditions was shown to be susceptible to a theoretical analysis. A

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method for determining the current efficiency for the electropolymerization process was developed and confirmed using azulene. Keywords: Redox switching, Polythionine, Kinetics, Electrode potential. (aw)

**DESCRIPTORS:** (U) \*ELECTROCHEMISTRY, \*ELECTRODES, \*SURFACE CHEMISTRY, \*ANALYTICAL CHEMISTRY, \*TRACE ELEMENTS, ACETAMIDES, ADSORPTION, ALKALINITY, CHARGE TRANSFER, DIFFUSION, EFFICIENCY, FARADAY EFFECT, GOLD, HEMISPHERES, IONS, MERCURY, MODELS, NUCLEATION, OXIDATION, OXIDATION REDUCTION REACTIONS, PHYSICAL PROPERTIES, PLATINUM, POLYCRYSTALLINE, POLYMERIZATION, SILVER, SILVER ALLOYS, SILVER COMPOUNDS, SOLIDS, SOLUTIONS(MIXTURES), STEADY STATE, SULFIDES, SULFUR COMPOUNDS, SULFURIC ACID, SURFACES, SWITCHING, THEORY, TRACER STUDIES, LEAD(METAL), DEPOSITION, ELECTRIC CURRENT, REACTION KINETICS, AZULENES.

**IDENTIFIERS:** (U) PEG1102F, WUAFOSR2303A1, Polythionine, Electrode Potential.

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## DTIC REPORT BIBLIOGRAPHY

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CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF ELECTRICAL  
ENGINEERING AND COMPUTE R SCIENCES

AEROCHEM RESEARCH LABS INC PRINCETON NJ

(U) Molecular Beam Epitaxy for Combined Optical and  
Electronic Circuits.

DESCRIPTIVE NOTE: Final rept. 8 Jan 83-8 Jan 84,

DEC 84

PERSONAL AUTHORS: Wieder, H. H.

CONTRACT NO. AFOSR-83-0297

PROJECT NO. 2917

TASK NO. A3

MONITOR: AFOSR  
TR-89-1727

UNCLASSIFIED REPORT

ABSTRACT: (U) This is a final report on the purchase and installation of a Molecular Beam Epitaxial (MBE) Deposition Machine. Additional funds were provided by the National Science Foundation, by USCD Intramural contributions and by the Powell (private) foundation for a total of \$471,000. The machine presently in operation is a modified Varian Associates Gen.II Machine without the low energy electron diffraction and without the Auger surface spectrometer. (RRH)

DESCRIPTORS: (U) \*ELECTRONIC EQUIPMENT, \*EPITAXIAL GROWTH, \*MOLECULAR BEAMS, \*OPTICAL CIRCUITS, \*SURFACES, AUGER ELECTRON SPECTROSCOPY, AUGER ELECTRONS, CIRCUITS, ELECTRON DIFFRACTION, LOW ENERGY.

IDENTIFIERS: (U) WJAFOSR2917A3, PE81102F.

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EVJ20M

(U) Computer Modeling of Soot Formation Comparing Free  
Radical and Ionic Mechanisms.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 88-30 Sep 89,

NOV 89

PERSONAL AUTHORS: Calcote, H. F.; Gill, Robert J.

REPORT NO. AEROCHEM-TP-486

CONTRACT NO. F49620-88-C-0007

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-1809

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Pennsylvania State Univ., University Park and Iowa State Univ., Ames.

ABSTRACT: (U) This is the second annual report on a collaborative effort between AeroChem, Penn State, and Iowa State to compare the relative importance of the free radical mechanism of Frenklach and associates and the ionic mechanism of Calcote and associates by use of computer programs run at Penn State and Iowa State. The thermodynamic and reaction kinetics coefficients for the detailed ionic reaction mechanism are being developed by correlating data in the literature and performing theoretical calculations. Comparison of the computer model using the present set of rate coefficients, with experimental ion concentrations in the standard acetylene-oxygen flame at 1.67 kPa demonstrates a number of problems with the present set of rate coefficients. These are being corrected. A comparison of the time it takes for the neutral and ionic mechanisms, using experimental species concentrations and typical rate coefficients used in two respective mechanisms, demonstrates that the time to add ten carbon atoms, from C sub 10 to C sub 20, by the two mechanisms is comparable. (kr)

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 525 7/4

STANFORD UNIV CA DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*FREE RADICALS, \*SOOT, ATOMS, CARBON, COEFFICIENTS, COMPARISON, COMPUTATIONS, COMPUTER PROGRAMS, ION DENSITY, IOWA, KINETICS, RATES, REACTION KINETICS, HYDRODYNAMICS, THEORY, THERMODYNAMICS, TIME.

(U) Measurement of Dispersion Relation of Chemical Waves in an Oscillatory Reacting Medium,

88

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2, Ionic mechanisms.

PERSONAL AUTHORS: Pagola, A.; Ross, J.; Vidal, C.

CONTRACT NO. AFOSR-87-0120

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-89-1764

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v92 n1 p163-166 1988.

ABSTRACT: (U) Nonlinear reactions with a sufficiently complex reaction mechanism, maintained far from equilibrium, can transmit and sustain chemical waves or fronts that are traveling chemical concentration gradients. There have been many visual observations of chemical waves, including kinematic waves, relaxation oscillation waves, and phase waves. The techniques, are being used to determine the velocity, profiles of fronts, invariance of structure in relaxation oscillation waves, and the formation of stationary spatial structures. We report measurements of the dispersion relation for chemical trigger waves propagating in an oscillatory Belousov-Zhabotinsky reacting medium. The waves are induced by a temperature perturbation (laser heating). The results are in qualitative agreement with a theory of such waves in an excitable medium. Reprints. (AW)

DESCRIPTORS: (U) \*CHEMICALS, \*OSCILLATION, \*HEAT TRANSFER, \*WAVE PROPAGATION, CONCENTRATION(CHEMISTRY), DISPERSION RELATIONS, EXCITATION, GRADIENTS, HEATING, INVARIANCE, KINEMATICS, LASER APPLICATIONS, MEASUREMENT, NONLINEAR SYSTEMS, PERTURBATIONS, RELAXATION, REPORTS, REPRINTS, SPATIAL DISTRIBUTION, STATIONARY, STRUCTURES, TEMPERATURE, TRIGGER CIRCUITS, VISUAL PERCEPTION, WAVES, CHEMICAL REACTIONS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Chemical Waves, Laser Heating.

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Complex Oscillations in the Combustion of Acetaldehyde,

OCT 88

PERSONAL AUTHORS: Harding, Robert H.; Sevcikova, Hana; Ross, John

CONTRACT NO. AFOSR-87-0120

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1765

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics. v89  
n8 p4737-4742, 15 Oct 88.

ABSTRACT: (U) The combustion of organic fuels is of interest for many reasons, and one is that their complicated nonlinear thermo-kinetic mechanisms result in a variety of dynamic states. Experiments on the combustion of acetaldehyde (ACH) in a continuous-flow, stirred, tank reactor (CSTR) have shown chemical oscillations, multiple steady states, and hysteresis between periodic and stationary states. Aperiodic dynamics are observed experimentally in the cool flame combustion region of acetaldehyde (ACH) in a continuous stirred tank reactor (CSTR). A gradual transition is seen, with variation of exit orifice size, from limit cycle oscillation to aperiodic variations in light emission, and then back to near periodic oscillations. We analyze this transition by calculating power spectra, autocorrelation functions, phase portraits, period distributions and Poincare sections. The variation in peak amplitude and peak-to-peak period of the temporal variations of light emission increases during the transition. There are many initial indications of a transition to chaos. However, after an in-depth analysis, given in the following article, we ascribe the transition to the presence of a Hopf bifurcation and noise: the path traced out in the constraint space by the change in exit orifice size is nearly tangent to a Hopf bifurcation set

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but does not cross this set. Reprints. (aw)

DESCRIPTORS: (U) \*ACETALDEHYDE, \*COMBUSTION, \*FUELS, \*OSCILLATION, AMPLITUDE, AUTOCORRELATION, CHEMICALS, COOL FLAMES, CYCLES, DYNAMICS, EMISSION, EXITS, FUNCTIONS(MATHEMATICS), HYSTERESIS, LIGHT, ORGANIC MATERIALS, ORIFICES, PEAK VALUES, PERIODIC VARIATIONS, POWER SPECTRA, REGIONS, REPRINTS, SIZES(DIMENSIONS), STEADY STATE, TANGENTS, TIME INTERVALS, KINETICS, CHEMICAL REACTORS, BIFURCATION(MATHEMATICS), NOISE.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B1, CSTR(Continuous Flow Stirred Tank Reactor), Hopf Bifurcation.

AD-A216 519 20/5

CHICAGO UNIV IL DEPT OF CHEMISTRY

(U) Theoretical and Experimental Studies of Molecular Dynamics.

DESCRIPTIVE NOTE: Final rept. 1 Oct 84-30 Sep 85,

OCT 85

PERSONAL AUTHORS: Rice, Stuart A.

CONTRACT NO. F49620-85-C-0003

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-1728

UNCLASSIFIED REPORT

ABSTRACT: (U) We report a study of very low energy collision induced vibrational relaxation using an approximate resonant state formalism which relates the inelastic cross section to the properties of metastable states. A study of models reveals that the combined effect of low collision energy resonance and high initial diatomic vibrational excitation can lead to a large enhancement of the vibrational relaxation cross section. In general, both the Wigner threshold requirement, is the initial relative momentum, and the existence of collision energy resonances can lead to increases in the very low energy relaxation cross section. Indeed, the threshold requirement increasingly enhances the contribution of a resonance to the cross section the closer the resonance is to zero collision energy. (jes)

DESCRIPTORS: (U) \*DIATOMIC MOLECULES, COLLISIONS, CROSS SECTIONS, DYNAMICS, ELASTIC PROPERTIES, ENERGY, EXCITATION, EXPERIMENTAL DATA, METASTABLE STATE, MODELS, MOLECULAR PROPERTIES, MOMENTUM, OPTIMIZATION, RELAXATION, REQUIREMENTS, RESONANCE, THEORY, THRESHOLD EFFECTS, VIBRATION.

IDENTIFIERS: (U) WUAFOSR2303B1, PE81102F.

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COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Laser Studies of Ion Collision Dynamics.

(U) Effect of Methyl Substitution on the Interaction of Benzene with Ni(100): An Experimental and Theoretical Study.

DESCRIPTIVE NOTE: Final rept.,

JUL 84

87

PERSONAL AUTHORS: Leone, Stephen R.

PERSONAL AUTHORS: Myers, A. K.; Benziger, J. B.

CONTRACT NO. AFOSR-84-0210

CONTRACT NO. AFOSR-86-0050

PROJECT NO. 2917

PROJECT NO. 2303

TASK NO. A2

TASK NO. A2

MONITOR: AFOSR  
TR-89-1725MONITOR: AFOSR  
TR-89-1768

UNCLASSIFIED REPORT

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**ABSTRACT:** (U) The cw ring dye laser system specified in this grant was purchased and fully installed and operational in December 1984. The items of equipment procured were a Coherent Radiation model Innova 20 argon ion laser, a Coherent Radiation model CR699-21 ring dye laser, and a Coherent Radiation model 240PP-2 spectrum analyzer. The acquisition cost of all the items for the total bid package required the full \$102,500. FOB Boulder and completely installed. Coherent Radiation did negotiate to give a price reduction in the amount of three per cent over their list prices. However, because of price increases it was not possible to obtain the wavemeter which was specified in the original grant proposal as part of these instrumentation funds. (KR)

**DESCRIPTORS:** (U) \*RING LASERS, \*CONTINUOUS WAVE LASERS, \*DYE LASERS, ACQUISITION, COHERENT RADIATION, COLLISIONS, COSTS, DYNAMICS, INSTRUMENTATION, IONS, ARGON LASERS, MODELS, MONEY, REDUCTION, WAVEMETERS.

IDENTIFIERS: (U) WUAFOSR2917A2, PEG1102F.

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SUPPLEMENTARY NOTE: Pub. in Langmuir, v3 p414-423 1987.

**ABSTRACT:** (U) The adsorption of benzene, toluene, o-m-, and p-xylene, and mesitylene on the Ni(100) crystal face was studied in order to elucidate the role of methyl substitution on the interaction of the aromatic ring with the surface. Temperature-programmed reaction (TPR) and reflection absorption infrared spectroscopy (RAIS) were used to characterize adsorption bond strengths and modes of bonding to the surface. All molecules appear to initially adsorb with the ring parallel to the surface. Methyl substituents were found to decrease the binding energy of the ring to the surface by about 65 kJ/mol independent of the number of substituents. Whereas benzene and mesitylene desorption occurred in single peaks, toluene and xylenes exhibited several additional lesser peaks or shoulders, suggesting the possibility of more than one type of bonding configuration. Reprints. (KR)

**DESCRIPTORS:** (U) \*BENZENE, \*SUBSTITUTION REACTIONS, \*METHYL RADICALS, ABSORPTION SPECTRA, ADSORPTION, AROMATIC COMPOUNDS, BONDING, CONFIGURATIONS, INFRARED SPECTROSCOPY, MOLECULES, REFLECTION, RINGS, SPECTROSCOPY, STRENGTH(MECHANICS), SUBSTITUTES, TOLUENES, XYLENES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

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MARYLAND UNIV COLLEGE PARK INST FOR PHYSICAL SCIENCE AND TECHNOLOGY

WYOMING UNIV LARAMIE DEPT OF BIOCHEMISTRY

(U) Research Equipment.

(U) Gas-Phase Protein Sequenator.

DESCRIPTIVE NOTE: Final rept. 1 Sep 83-31 Jan 85,

DESCRIPTIVE NOTE: Final rept.,

MAR 89

JUN 84

PERSONAL AUTHORS: KELLOGG, R. B.

PERSONAL AUTHORS: Lewis, Randy V.

CONTRACT NO. AFOSR-83-0286

CONTRACT NO. AFOSR-83-0208

PROJECT NO. 2304

PROJECT NO. 2917

TASK NO. A5

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-1736

TR-89-1729

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) The major research conducted with this machine has been the proposed characterization of opioid and non-opioid peptides secreted by the adrenal medulla. To date the sequencer has run 110 samples of which 75 have been adrenal medullary peptides. The other samples have been snake toxins, immunoglobulin fragments, photolabeled fragments of carnitine acetyl-transferase, and several single samples from a variety of investigators. Keywords: Proteins, Gas phase. Sequences. (sdw)

ABSTRACT: (U) The purpose of the report was to provide additional equipment for a computational laboratory dedicated to research in numerical analysis and applied mathematics. The report summarizes the equipment acquired and the research being presently carried out in the laboratory. The research is on topics in boundary integral equations, adaptive finite elements, numerical methods for a scattering problems, continuation methods, and very accurate arithmetic calculations. (KR)

DESCRIPTORS: (U) \*APPLIED MATHEMATICS, \*COMPUTERS, \*NUMERICAL ANALYSIS, ACCURACY, ADAPTIVE SYSTEMS, ARITHMETIC, BOUNDARIES, COMPUTATIONS, FINITE ELEMENT ANALYSIS, INTEGRAL EQUATIONS, LABORATORY EQUIPMENT, NUMERICAL METHODS AND PROCEDURES, SCATTERING.

DESCRIPTORS: (U) \*PROTEINS, \*VAPOR PHASES, ADRENAL MEDULLA HORMONES, FRAGMENTS, IMMUNOGLOBULINS, SAMPLING, SNAKES, TOXINS AND ANTITOXINS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A4.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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FLORIDA UNIV GAINESVILLE DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

IDAHO UNIV MOSCOW

(U) Ultrastructural Processing of Ceramics, Glasses and  
Composites.(U) The Formation and Use of Knowledge Structures in  
Problem Solving Domains.

DESCRIPTIVE NOTE: Final rept. 1 Jul 83-31 Jul 84.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 88-30 Sep  
89,

SEP 84

OCT 89

PERSONAL AUTHORS: Hensch, Larry L.

PERSONAL AUTHORS: Gordon, Sallie E.; Gill, Richard T.

CONTRACT NO. AFOSR-83-0287

CONTRACT NO. AFOSR-88-0063

PROJECT NO. 2917

PROJECT NO. 2313

TASK NO. A2

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-1738

UNCLASSIFIED REPORT

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ABSTRACT: (U) The purpose of this grant was to purchase an Inductively Coupled Plasma (ICP) Chemical Analysis System, a Fourier Transform Infrared Gas Cell accessory, and other accessories for the characterization of chemically processed ceramics, glasses, and composites. (av)

ABSTRACT: (U) The goal of this research was to develop and test a method for eliciting knowledge structures used in problem solving. The work was carried out simultaneously in two domains, engineering mechanics and video recording. Two studies resulted in the adaptation of a question probe method for eliciting relevant knowledge structures prior to problem solving. Two additional studies showed that administration of the question probes did not significantly impact subsequent problem solving. Answers from the question probes were therefore translated into a conceptual structure for each subject. A simple associative search model operating upon these structures was able to predict 87% and 93% of individual problem solving activities in the engineering and video recording domains, respectively. The predictive capability of the graphs indicate the central role of knowledge structures capability of the graphs indicate the central role of knowledge structures in problem solving processes. At least under circumstances such as those tested. A fifth study evaluated the validity of the conceptual graphs by comparing them with free recall protocols. (KR)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*GLASS, \*COMPOSITE MATERIALS, \*TEST EQUIPMENT, CHEMICAL ANALYSIS, CHEMISTRY, COUPLING(INTERACTION), PLASMAS(PHYSICS), PROCESSING, CHEMICAL ENGINEERING, CELLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A2, ICP(Inductively Coupled Plasma), Gas Cells.

DESCRIPTORS: (U) \*TEST METHODS, \*PROBLEM SOLVING, ENGINEERING, GRAPHS, MECHANICS, PREDICTIONS, PROBES.

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RECALL, SEARCHING, VIDEO RECORDING.

WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

IDENTIFIERS: (U) WUAFOSR2313A4, PE61102F.

(U) A New Parallel Add.

DESCRIPTIVE NOTE: Final technical rept. Nov 88-Oct 89,

OCT 89

PERSONAL AUTHORS: Zhang, Cun-Quan

CONTRACT NO. AFOSR-89-0068

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR  
TR-89-1863

UNCLASSIFIED REPORT

ABSTRACT: (U) A new parallel add is introduced in this paper which consists of  $(2 \text{ to the } m \text{ power } -1) (m+3)+1$  3-input modules and costs  $m+1$  time units when processing a sum of two binary numbers of length at most 2 to the  $m$  power. (RRH)

DESCRIPTORS: (U) \*CALCULATORS, POWER.

IDENTIFIERS: (U) WUAFOSR2304A8.

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VERMONT UNIV BURLINGTON DEPT OF PSYCHIATRY

SMITH-KETTLEWELL EYE RESEARCH FOUNDATION SAN FRANCISCO CA

(U) Role of Protein Phosphorylation in the Regulation of Neuronal Sensitivity.

DESCRIPTIVE NOTE: Rept. for Sep 84-Mar 85.

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 15 Oct 88-14 Oct 89.

MAR 85

DEC 89

PERSONAL AUTHORS: Ehrlich, Yigal H.

PERSONAL AUTHORS: McKee, S.

CONTRACT NO. AFOSR-84-0331

CONTRACT NO. AFOSR-89-0035

PROJECT NO. 2312

PROJECT NO. 2313

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR  
TR-89-1842MONITOR: AFOSR  
TR-89-1884

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report covers studies three principal topics: A. Establishing differentiated NG108-15 cells (NG cells) grown in culture as a model system for studying the role of protein phosphorylation in the regulation of neuronal function and neuronal adaption. B. Characterizing ecto-protein kinase activity and its endogenous substrates in neural cells, and determining their role in regulating receptor sensitivity. C. Raising monoclonal antibodies against specific neuronal phosphoproteins, with emphasis on the 54KDa substrate of a GTP-prefering protein kinase, and the substrates of ectokinase activity. These antibodies will be used in experiments designed to provide direct evidence for the function of these phosphoproteins. (aw)

DESCRIPTORS: (U) \*NERVE CELLS, \*PHOSPHORYLATION, \*PROTEINS, \*SENSITIVITY, ANTIBODIES, FUNCTIONS, MODELS, MONOCLONAL ANTIBODIES, NERVOUS SYSTEM, PHOSPHOPROTEINS, SENSE ORGANS, SUBSTRATES, PHOSPHORUS TRANSFERASES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, Protein Kinase.

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## UNCLASSIFIED

DESCRIPTORS: (U) \*DISCRIMINATION, \*SPACE PERCEPTION.

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\*MOVING TARGETS, ACCELERATION, CORRELATORS, ENERGY, EYE, FREQUENCY, HUMANS, IMAGE PROCESSING, INSECTS, MODELS, MOTION, MULTIPLICATION FACTOR, NETWORKS, NONLINEAR SYSTEMS, OPERATION, SPATIAL DISTRIBUTION, VELOCITY, VISUAL PERCEPTION, MATHEMATICAL MODELS, MATHEMATICAL FILTERS.

CALIFORNIA UNIV DAVIS

(U) Methods of Non-Parametric Inference.

DESCRIPTIVE NOTE: Final rept. 1 Jul 85-30 Jun 89.

JUL 89

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, \*Motion Perception, Motion Discrimination, Spatial Filtering, Temporal Filtering, Sinusoidal Motion, Spatial Frequency, Temporal Frequency.

PERSONAL AUTHORS: Wang, Jane-Ling

CONTRACT NO. AFOSR-85-0268

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-1882

UNCLASSIFIED REPORT

ABSTRACT: (U) This project deals with several nonparametric inference problems including two-sample tests, linear regression and estimation of distribution and related functions such as density and hazard rate functions. Estimators with desired aging properties were constructed for IFRA and NBU distribution functions respectively based on randomly censored data and shown to be  $n$  to the  $1/2$  power-equivalent to the product-limit estimator. Nonparametric maximum likelihood estimator and its strong consistency were also derived for an IFR distribution for unidentifiable cause-of-failure data. Local asymptotic properties (strong consistency, asymptotic normality and mean squared error) of the kernel density and hazard rate estimators were obtained via a recent i.i.d. representation of the product-limit estimator. The results on kernel estimates were applied to obtain point and interval estimates of the change-point of a hazard rate function. Several median type two-sample test procedures which allows early termination of the study were constructed. Some two-sample measures for differences of distribution functions were compared and used to analyze interdistribution income inequality. (RRH)

DESCRIPTORS: (U) \*DISTRIBUTION FUNCTIONS, \*ESTIMATES, \*LINEAR REGRESSION ANALYSIS, AGING(MATERIALS), ASYMPTOTIC NORMALITY, ASYMPTOTIC SERIES, DENSITY, DISTRIBUTION, FUNCTIONS, HAZARDS, INTERVALS, RATES.

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XEROX PALO ALTO RESEARCH CENTER CA

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A5.

(U) Pulsed Laser Deposition of High T sub c  
Superconducting Thin Films.

DESCRIPTIVE NOTE: Final technical rept. 15 Nov 88-15 Oct  
89,

DEC 89

PERSONAL AUTHORS: Boyce, J. B.; Connell, G. A.

CONTRACT NO. F49620-89-C-0017

PROJECT NO. 2306

TASK NO. C1

MONITOR: AFOSR  
TR-89-1875

UNCLASSIFIED REPORT

ABSTRACT: (U) Superconducting thin films have been deposited in-situ on several substrate materials using pulsed excimer laser deposition. On the standard oxide substrates, excellent films were obtained. They had high transition temperatures with narrow transition widths, metallic conductivity in the normal state, low room-temperature resistivity, high critical currents, c-axis orientation, and epitaxial alignment with the substrate. On the more technologically relevant substrates of sapphire and silicon, world record, though less optimal, results were obtained. The transition temperatures were high and metallic conductivity was obtained in the normal state. However, the room-temperature and microwave surface resistivities were higher and the critical currents lower than for the above substrates. These diminished transport properties correlate with the imperfect alignment and epitaxy of the superconductor substrate. For silicon substrates, a buffer layer is required due to high reactivity even at low temperatures. The best results were obtained on clean, hydrogen-terminated surfaces rather than oxidized silicon. Epitaxial alignment was achieved, but there was a substantial spread in orientations, accounting for the diminished transport properties. (RRP)

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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DESCRIPTORS: (U) \*DEPOSITION, \*EPITAXIAL GROWTH, \*PULSED LASERS, \*SAPPHIRE, \*SILICON, \*SUBSTRATES, \*SUPERCONDUCTORS, \*THIN FILMS, ALIGNMENT, BUFFERS, CONDUCTIVITY, CURRENTS, ELECTRICAL RESISTANCE, EXCIMER, HIGH RATE, HIGH TEMPERATURE, LASERS, LAYERS, LOW TEMPERATURE, MATERIALS, METALS, MICROWAVES, OXIDATION, OXIDES, PULSES, REACTIVITIES, RESISTANCE, ROOM TEMPERATURE, SURFACES, TRANSITION TEMPERATURE, TRANSITIONS, TRANSPORT PROPERTIES, WIDTH.

BATTELLE COLUMBUS DIV OH

(U) Studies of Millimeter-Wave Diffraction Devices and Materials.

DESCRIPTIVE NOTE: Final rept. 1 Sep 82-31 Oct 84,

DEC 84

PERSONAL AUTHORS: Seiler, Milton R.; Ridgway, Richard W.

IDENTIFIERS: (U) WJAFOSR2306C1.

CONTRACT NO. F49620-82-C-0099

MONITOR: AFOSR  
TR-89-1861

## UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental results of a study to explore millimeter-wave beam-steering by techniques of diffraction are presented. When periodic structures, such as metallic gratings, are brought into proximity with a dielectric waveguide, radiation or reception of radiation at a controlled angle is possible. The direction of the beam is controlled by the period of the grating while the half-power beamwidth is controlled by the total length of the grating. Results are given for a variety of gratings formed by metallic blocks, ferro-fluid, and springs. Photoconductive gratings, varistors, and bulk acoustic wave devices were among other techniques researched in this program. Results indicate that the laser-excited photoconductive grating has promising potential for rapid beam steering. Keywords: Millimeter wave; Dielectric; Beam steering; Silicon; Diffraction; Ferrofluid; Varistor; Cadmium sulfide; Ferrites; Antenna waveguide; Semiconductor; Grating; Gallium arsenide.(jhd)

DESCRIPTORS: (U) \*BEAM STEERING, \*DIFFRACTION, \*GRATINGS(SPECTRA), \*MILLIMETER WAVES, ACOUSTIC WAVES, ANGLES, ANTENNAS, CADMIUM SULFIDES, CONTROL, DIELECTRICS, FERRITES, LENGTH, METALS, RADIATION, RECEPTION, SILICON, SPRINGS, STRUCTURES, VARISTORS, WAVE PROPAGATION, WAVEGUIDES, GALLIUM ARSENIDES.

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HARVARD UNIV CAMBRIDGE MA

(U) The Neuropsychology of Imagery Processing.

DESCRIPTIVE NOTE: Annual technical rept. Dec 88-Dec 89,

NOV 89

PERSONAL AUTHORS: Kosslyn, Stephen M.

REPORT NO. TR-89-2

CONTRACT NO. AFOSR-88-0012

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-1733

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Progress has been made in six areas. First, a task battery to assess high-level visual abilities has been fully implemented. This battery is administered and scored on the Macintosh computer. Second, the task battery has been used to examine one patient in detail, and has diagnosed a subtle visual deficit that is consistent with both the lesion location and regions of hypometabolism (as measured by PET scanning). Third, additional brain-damaged patients have been tested in order to discover whether the visual angle subtended by imaged objects is systematically related to the amount of damage to the occipital lobe. Data from these three patients suggests such a relation. Fourth, the computer stimulation of high-level vision is fully functional, and predictions have been generated about previously unnoticed syndromes. For example, the model predicts that some patients will be able to recognize faces but not common objects. Some of these predictions currently are being tested. Fifth, three subjects have been given imagery tasks while being PET scanned. The results are consistent with the predictions of the theory. In particular, the medial occipital and frontal activation is consistent with the claim that images are patterns of activation in topographically mapped areas and that they are built up sequentially. Finally, response time studies

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using divided visual field techniques have provided evidence for two ways of representing spatial relations, as categories (e.g., left/right; above/below) or precise metric amounts; the left hemisphere is generally more effective at computing categorical spatial relations, and the right hemisphere is generally more effective at computing metric spatial relations. (sdw)

**DESCRIPTORS:** (U) \*IMAGE PROCESSING, \*NERVOUS SYSTEM, \*BEHAVIOR, ACTIVATION, ANGLES, COMPUTERIZED SIMULATION, DEFICIENCIES, HEMISPHERES, LESIONS, OPTICAL IMAGES, PATIENTS, PATTERNS, POSITION(LOCATION), PREDICTIONS, REACTION TIME, SIGNS AND SYMPTOMS, SPATIAL DISTRIBUTION, THEORY, TIME STUDIES, VISION.

**IDENTIFIERS:** (U) PEG1102F, WUAFOSR2313A4, \*Neuropsychology.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF PSYCHOLOGY

WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

(U) Neural Mechanisms of Attention.

(U) Long Path Connectivity of Regular Graphs.

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 87-31 Jul 89.

DESCRIPTIVE NOTE: Final technical rept. Nov 88-Oct 89,

NOV 89

OCT 89

PERSONAL AUTHORS: Olton, David; Egeth, Howard; Pang, Kevin

PERSONAL AUTHORS: Zhang, Cun-Quan; Zhu, Yong-Jin

CONTRACT NO. AFOSR-87-0389

CONTRACT NO. AFOSR-89-0068

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. A4

TASK NO. A8

MONITOR: AFOSR  
TR-89-1734MONITOR: AFOSR  
TR-89-1862

## UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This project achieved both of its stated goals. (1) The activity of single units was recorded while rats performed a divided attention task. The behavioral correlates of these units indicate three different classes: divided attention executive cells, selective attention cells, task cells. These indicate ways in which the frontal cortex is involved in attention, and provides information that can be incorporated into model systems. (2) New behavioral tasks were developed to measure reaction time in rats. These are similar to those used for testing humans, and provide animal models to assess the neuroanatomical, neuropharmacological, and electrophysiological processes involved in other kinds of attention. Keywords: Attention, Frontal cortex, Divided attention, Electrophysiological recording (unclassified). (sdw)

ABSTRACT: (U) Any pair of vertices in a 4-connected, non-bipartite, k-regular graph are joined by a Hamilton path or a path of length at least  $3k-6$ . (JHD)

DESCRIPTORS: (U) \*GRAPHS, PATHS, HAMILTONIAN FUNCTIONS.

IDENTIFIERS: (U) Nonbipartite Graphs, Vertices, PE81102F, WUAFOSR2304A8.

DESCRIPTORS: (U) \*ATTENTION, \*ELECTROPHYSIOLOGY, \*BEHAVIOR, ANIMALS, CELLS, EXECUTIVE ROUTINES, HUMANS, MODELS, NERVOUS SYSTEM, RATS, REACTION TIME, RECORDING SYSTEMS, CEREBRAL CORTEX.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A4.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 475 5/8 25/4

MINNESOTA UNIV MINNEAPOLIS SCHOOL OF PHYSICS AND ASTRONOMY

HARVARD UNIV CAMBRIDGE MA DEPT OF PSYCHOLOGY

(U) Superconductivity of Thin Film Intermetallic Compounds.

(U) Multi-Level Processing in Human Speech Recognition.

DESCRIPTIVE NOTE: Research progress and forecast rept. 1  
Sep 84-1 Mar 85,

DESCRIPTIVE NOTE: Final technical rept. Jun 88-Jun 89,

SEP 89

MAR 85

PERSONAL AUTHORS: Goldman, Allen

PERSONAL AUTHORS: Gordon, Peter C.

CONTRACT NO. AFOSR-84-0347

CONTRACT NO. AFOSR-87-0305

PROJECT NO. 2306

PROJECT NO. 2313

TASK NO. C1

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR

TR-1730

TR-89-1732

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The major effort related to facilities has been the upgrading of the multi-source electron beam deposition system which is used to prepare the ternary and pseudoternary compounds that are being studied under the program. The vacuum chamber has been equipped with a Williamson noncontacting temperature sensing system for monitoring substrate temperature. With this system the temperature of the substrate is determined by computing the ratio of radiant energies emitted from the surface in two adjacent wavebands. We have not purchased a rate monitor which uses Electron Impact Emission Spectroscopy (EIES). The currently commercially available instrument, supplied by Inficon, has the capability for controlling only two sources, whereas in our applications there is a need for control of up to four. Keywords: Intermetallic compounds; Superconductivity. (SDW)

DESCRIPTORS: (U) \*INTERMETALLIC COMPOUNDS, \*SUPERCONDUCTIVITY, \*THIN FILMS, BAND SPECTRA, DETECTION, ELECTRON EMISSION, ELECTRON IMPACT SPECTRA, ENERGY MONITORING, MONITORS, RADIATION, RATES, RATIOS, SUBSTRATES, TEMPERATURE, VACUUM CHAMBERS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2306C1.

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ABSTRACT: (U) This project has investigated the thesis that perception of the speech signal occurs at different levels of resolution. It has addressed this thesis in the domain of the temporal components of speech, where multiple levels of resolution are evident in the prosodic (macrostructure) and segmental (microstructure) levels of analysis. The body of this report is divided into three parts. The first part addresses interactions between different levels of temporal information in the speech signal. The second part addresses complexities that occur in the use of temporal cues in recognizing phonetic segments. One study in this section explores the dependencies between vowel and fricative identities that are cued by the same durational acoustic cue. A second series of studies, conducted with Jennifer L. Eberhardt, explores the effects of attention on the perceptual salience of temporal cues to the identity of phonetic segments. The third part of this report, discusses work, conducted with David W. Gow, that addresses the macro-level of temporal information. This work explores the role of stress in recognition and memory. Keywords: Speech perception, Prosody, Context effects, Phonetic segments, Fricatives. (SDW)

DESCRIPTORS: (U) \*PERCEPTION (PSYCHOLOGY), \*SPEECH RECOGNITION, AUDITORY PERCEPTION, HUMANS, MICROSTRUCTURE, PROCESSING, RESOLUTION, SIGNALS, SPEECH, STRESSES, VOWELS.

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IDENTIFIERS: (U) PE81102F, WUAFOSR2313A4.

SRI INTERNATIONAL MENLO PARK CA COMPUTER AND INFORMATION SCIENCES DIV

(U) Advanced Concepts and Methods of Approximate Reasoning.

DESCRIPTIVE NOTE: Final rept. 4 Oct 88-3 Oct 89.

DEC 89

PERSONAL AUTHORS: Ruspini, Enrique H.

CONTRACT NO. F49620-89-K-0001

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-89-1894

UNCLASSIFIED REPORT

ABSTRACT: (U) The major portion of the research was devoted to the development of unified framework for the description of approximation reasoning methods that facilitates the study of their fundamental characteristics. This objective was attained by consideration of structures, defined in spaces of possible worlds that measure either the relative size of certain subsets (for probabilistic methods) or the similarity between possible states (for probabilistic methods). Possible worlds are formalizations of the notion of possible state or behavior of a system. Using this concept, an approximate reasoning problem may be described as one where available evidence is insufficient to determine if the actual state of the world lied among those conceivable possibilities, conceivable where a statement about the system is true. Keywords: Artificial intelligence. (kr)

DESCRIPTORS: (U) \*REASONING, ARTIFICIAL INTELLIGENCE, GLOBAL, METHODOLOGY, PROBABILITY, SIZES(DIMENSIONS).

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A7, LPN-SRI-6488.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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AD-A216 472 5/8

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF BRAIN AND  
COGNITIVE SCIENCES

STANFORD UNIV CA DEPT OF PSYCHOLOGY

(U) Vision Algorithms and Psychophysics.

(U) Induced Pictorial Representations.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Aug 89.

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 1 Nov 88-  
30 Nov 89.

OCT 89

DEC 89

PERSONAL AUTHORS: Richards, Whitman

PERSONAL AUTHORS: Tversky, Barbara

CONTRACT NO. F49620-83-C-0135, \$AFOSR-86-0139

CONTRACT NO. AFOSR-89-0076

PROJECT NO. 2313

PROJECT NO. 2313

TASK NO. A5

TASK NO. A4

MONITOR: AFOSR  
TR-89-1883MONITOR: AFOSR  
TR-89-1885

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Representing shapes in a manner suitable for recognition has been a challenge for machine vision. Here we approach this problem by combining studies of representations used by the human visual system with computational studies of how such representations can be derived and manipulated by machine. Both axial-based and contour-based descriptors were investigated, with emphasis on the role of curvature which was found to be an important primitive underlying both types of representations. Related, but unreported, studies include color and motion, which often serve as the glue that allows one to form appropriate groupings of broken image contours or tokens. This research has yielded over fifty publications, with only the major thrust summarized here. Keywords: Image understanding, Shape recognition, Visual pattern recognition, Visual psychophysics, Vision algorithms.

DESCRIPTORS: (U) \*ALGORITHMS, \*PATTERN RECOGNITION, \*PSYCHOPHYSICS, \*VISUAL PERCEPTION, COMPUTATIONS, CONTOURS, CURVATURE, HUMANS, IMAGES, OPTICAL IMAGES, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5.

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ABSTRACT: (U) Researchers agree that mental representations of discourse are established at many levels, including a model of the situation described by the discourse. I describe two sets of studies investigating spatial properties of mental models induced by text. In the first set, Holly Taylor and I have found that descriptions written from different perspectives, route and survey, seem to induce the same perspective-free spatial models termed spatial frameworks. In the second set of studies, Nancy Franklin and later David Bryant and I have gathered detailed data on a spatial framework capturing a common situation, of an observer surrounded by objects. That spatial framework is not perception-like, but rather reflects conceptions of space. Extensions of both paradigms are discussed. This early research indicates that situation models constructed from text contain spatial properties, such as relative locations and directions, but are not perception-like or image-like. They are more general than a particular view, allow different perspectives, and have differential access to different parts. Keywords: Mental images; Learning. (KT)

DESCRIPTORS: (U) \*MENTAL ABILITY, ACCESS, IMAGES, LEARNING, MODELS, POSITION(LOCATION), SPATIAL DISTRIBUTION.



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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CALIFORNIA UNIV LOS ANGELES DEPT OF MATHEMATICS

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4.

(U) Algorithms to Solve Nonlinear Time Dependent Problems of Engineering and Physics.

DESCRIPTIVE NOTE: Final rept. 1 May-31 Oct 89.

NOV 89

PERSONAL AUTHORS: Osher, Stanley

CONTRACT NO. AFOSR-89-0341

PROJECT NO. 2304

TASK NO. 00

MONITOR: AFOSR  
TR-89-1755

UNCLASSIFIED REPORT

ABSTRACT: (U) A project was developed concerning fronts propagating with curvature dependent speed. New algorithms were derived approximating the equations of motion, which resemble Hamilton-Jacobi equations with parabolic right-hand sides, by using techniques from hyperbolic conservation laws. Essentially non-oscillatory schemes are used. These methods accurately capture the formation of sharp gradients and cusps in the moving fronts. The algorithms handle topological merging and breaking naturally, and work in any number of space dimensions. The methods can also be used for more general Hamilton-Jacobi type problems. Applications of the algorithms include crystal growth, solidification of metals and flame propagation. (Jhd)

DESCRIPTORS: (U) \*CRYSTAL GROWTH, \*EQUATIONS OF MOTION, \*FLAME PROPAGATION, \*SOLIDIFICATION, ALGORITHMS, CURVATURE, GRADIENTS, HYPERBOLAS, METALS, NONLINEAR SYSTEMS, PARABOLAS, SHARPNESS, SIDES, TIME DEPENDENCE, VELOCITY.

IDENTIFIERS: (U) Hamilton Jacobi Equations, PE61102F, WUAFOSR230400.

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STEVENS INST OF TECH HOBOKEN NJ DEPT OF PHYSICS AND  
ENGINEERING PHYSICS

EFFICIENCY, EMISSION, ENERGY, GUARANTEES, GUNS, HIGH RATE,  
IMPACT, ION SOURCES, IONS, LOW ENERGY, MAXWELLS EQUATIONS,  
PRODUCTION, SILICON, SOLID ELECTROLYTES, SURFACES, THICK  
FILMS, WORK FUNCTIONS.

(U) Surface Production of Ions.

DESCRIPTIVE NOTE: Final scientific rept. 1 Aug 86-30 Sep  
89,

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

OCT 89

PERSONAL AUTHORS: Seidl, Milos

CONTRACT NO. AFOSR-86-0289

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-1876

UNCLASSIFIED REPORT

ABSTRACT: (U) It has been shown that negative hydrogen ions can be produced with high efficiency by backscattering low energy (order of 1 eV) hydrogen atoms or ions from low work-function (less than 1.5 eV) surfaces. This has been demonstrated experimentally by backscattering the Maxwellian tail of thermally produced hydrogen atoms from a variety of low work function surfaces. The general nature of the electron transfer process has been described by a simple theoretical model. Low incident energy guarantees low energy spread of the negative hydrogen ions. It also makes it possible to consider a variety of adsorbates for reducing the work function of the converter surface. The work function of cesium-oxygen films on silicon can be as low as 0.9 eV but these films are too delicate for use on converter surfaces. Thick cesium oxide films with a work function ranging from 1.2 to 1.4 eV have been successfully used on converter surfaces. Surface production of cesium ions from solid electrolyte sources has been investigated. Three types of cesium ion guns were developed and used in the experiments. Keywords: Ion emission; Ion sources; Atom; Molecule and ion impact. (JMD)

DESCRIPTORS: (U) \*ANIONS, \*BACKSCATTERING, \*ELECTRON  
TRANSFER, \*HYDROGEN, CESIUM, CESIUM COMPOUNDS, CONVERTERS,

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UNIVERSITY OF WESTERN ONTARIO LONDON DEPT OF PHYSICS

(U) Merged Beam Studies into the Mechanisms of Hydrogen Molecular Ion Recombination.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Aug 89,

SEP 89

PERSONAL AUTHORS: Mitchell, J. B.

CONTRACT NO. AFOSR-87-0365

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-1896

UNCLASSIFIED REPORT

ABSTRACT: (U) Measurements of the dissociative Recombination and Excitation of  $\text{HeH}^+$ , the dissociative excitation of  $\text{H}_3^+(+)$ , the branching ratio for the decay channels for  $\text{H}^+(3)$  ( $v=0$ ) recombination and the cross section for the recombination of  $\text{H}_2^+(+)$  ( $v=0$ ) have been performed and are described here. A discussion of the relevance of these measurements to the recombination of  $\text{H}_3^+(+)$  ( $v=0$ ) is given. Canada. (JHD)

DESCRIPTORS: (U) \*HYDROGEN, \*ION BEAMS, \*RECOMBINATION REACTIONS, CANADA, CROSS SECTIONS, DECAY, DISSOCIATION, EXCITATION, MOLECULES, RATIOS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2301A7.

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(U) Energy Decay and Boundary Control for Distributed Parameter Systems with Viscoelastic Damping.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-31 May 89,

JUL 89

PERSONAL AUTHORS: Hannsgen, Kenneth B.; Wheeler, Robert L

CONTRACT NO. AFOSR-86-0085

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-1895

UNCLASSIFIED REPORT

ABSTRACT: (U) This report concerns several aspects of active and passive stabilization of materials and structures, together with related dynamic problems with potential applications to stabilization. Results are described for determination of the interacting effects of viscoelastic and feedback dissipation in the damping of oscillations in certain rods and beams. Loss of stability or of well-posedness due to feedback delays is described. Additional results concern analysis of energy decay in elastic beams and an investigation of the Signorini problem for motion of an elastic body that abuts a rigid obstacle. Numerical and analytic studies are described for Bingham fluids as well as for several problems involving two-fluid flows. Finally, work on control problems for the Navier-Stokes equations is summarized. (JHD)

DESCRIPTORS: (U) \*DAMPING, \*NAVIER STOKES EQUATIONS, \*STABILIZATION, \*VISCOELASTICITY, BOUNDARIES, CONTROL, DECAY, DELAY, DISSIPATION, DISTRIBUTION, DYNAMICS, ELASTIC PROPERTIES, ENERGY, FEEDBACK, FLUID FLOW, INTERACTIONS, LOSSES, MATHEMATICAL ANALYSIS, NUMERICAL ANALYSIS, OSCILLATION, PARAMETERS, PASSIVE SYSTEMS, STABILITY.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVJ20M

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IDENTIFIERS: (U) Signorini Problem, Two Fluid Flow,  
PEG1102F, WUAFOSR2304A1.

CONNECTICUT UNIV STORRS DEPT OF MATHEMATICS

(U) Inverse Scattering and Tomography.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-31 May 89

MAY 89

PERSONAL AUTHORS: Madych, W. R.

CONTRACT NO. AFOSR-86-0145

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-1719

UNCLASSIFIED REPORT

ABSTRACT: (U) This report includes these topics: A Range Theorem for the Radon Transform, Multivariate Interpolation and Conditionally Positive Definite Function, Polyharmonic Cardinal Splines, Solutions of underdetermined systems of linear equations, Multivariate interpolation and conditionally positive definite functions II. (JES)

DESCRIPTORS: (U) INTERPOLATION, INVERSE SCATTERING, LINEAR ALGEBRAIC EQUATIONS, MULTIVARIATE ANALYSIS, THEOREMS, TOMOGRAPHY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A9.

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CLARKSON UNIV POTSDAM NY DIV OF RESEARCH

(U) Direct and Inverse Scattering Problem Associated with  
the Elliptic Sinh-Gordon Equation.

DESCRIPTIVE NOTE: Final rept. 30 Sep 86-30 Sep 89.

NOV 89

PERSONAL AUTHORS: Jaworski, M.; Kaup, D. J.

CONTRACT NO. AFOSR-86-0277

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-89-1720

UNCLASSIFIED REPORT

ABSTRACT: (U) The following is a report on the work achieved during the above period: Linear Stability of Vlasov-Poisson Electron Plasma in Crossed-Fields; Perturbations Propagating Parallel to the Magnetic Field; Two-Dimensional Nonlinear Schrodinger Equation and Self-Focusing in a Two-Fluid Model of Newtonian Cosmological Perturbations; The Third-Order Expansion of the Planar Cold-Fluid Magnetron Equations; and The Time Evolution of the Scattering Data for the Forced Toda Lattice. In addition to the above, there are also the following preprints in various stages of being accepted for publication: Quantization of Bihamiltonian Systems; The Elliptic Sinh-Gordon Equation; Coherent Structures in the Planar Magnetron; A Thermal Instability in the Planar Magnetron; Lattice Equations and Integrable Mappings; and A Model Initial Value Problem in Stimulated Raman Scattering. (aw)

DESCRIPTORS: (U) \*INVERSE SCATTERING. \*EQUATIONS, \*MATHEMATICAL ANALYSIS, COHERENCE, COSMOLOGY, EVOLUTION(GENERAL). EXPANSION, LIGHT SCATTERING, LINEARITY, MAGNETIC FIELDS, MAGNETRONS, MODELS, NONLINEAR DIFFERENTIAL EQUATIONS, PERTURBATIONS, PLANAR STRUCTURES, RAMAN SPECTRA, REPORTS, SCATTERING, SCHRODINGER EQUATION, STABILITY, STIMULATION(GENERAL), STRUCTURES, THERMAL INSTABILITY, TIME, TWO DIMENSIONAL, TWO PHASE FLOW,

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CALIFORNIA UNIV LOS ANGELES DEPT OF ELECTRICAL  
ENGINEERING

MATHEMATICS, STABILIZATION, OPTIMIZATION, SHAPE,  
STABILITY, STATICS, THEORY, TIME, TRANSLATIONS.

(U) Control and Stabilization of Linear and Nonlinear  
Distributed Systems.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A1.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 86-31 Dec  
88.

DEC 88

PERSONAL AUTHORS: Levan, N.; Wang, P. K.

CONTRACT NO. AFOSR-86-0132

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-1717

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes the results of a study on the control and stabilization of linear and nonlinear distributed systems covering the period from April, 1986 through December, 1988. The specific areas of this study consists of (i) stability enhancement of distributed systems describable by abstract linear evolution equations, (ii) a translation invariant approach to stability and stabilizability, (iii) stabilizability of bilinear systems, (iv) application of computer vision in static shape estimation, control, and failure detection in elastic systems, and (v) stabilization and control of distributed systems with application to aeroelastic systems with extendible lifting surfaces. The main objective of this study is to develop applicable mathematical theories and at the same time study specific systems arising from realistic aerospace applications. (KR)

DESCRIPTORS: (U) \*APPLIED MATHEMATICS, \*LINEAR SYSTEMS, \*NONLINEAR SYSTEMS, ABSTRACTS, AEROELASTICITY, AEROSPACE SYSTEMS, COMPUTER APPLICATIONS, COMPUTER GRAPHICS, CONTROL, CONTROL SYSTEMS, DETECTION, DISTRIBUTION, ELASTIC PROPERTIES, ESTIMATES, EVOLUTION(GENERAL), FAILURE, INVARIANCE, LINEAR ALGEBRAIC EQUATIONS.

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Propulsion, Nitroform Compounds.

CALIFORNIA INST OF TECH PASADENA DIV OF ENGINEERING AND  
APPLIED SCIENCE

(U) Contractors Meeting on Combustion Rocket Propulsion  
Diagnostics of Reacting Flow Held in Monrovia,  
California on 13-17 June 1988.

DESCRIPTIVE NOTE: Technical rept.,

JUN 88

PERSONAL AUTHORS: Tishkoff, J. M.; Birkan, M. A.; Roy, G.  
S.; Lekoudis, S. G.

CONTRACT NO. AFOSR-86-0337

PROJECT NO. 2308

MONITOR: AFOSR  
TR-89-1710

UNCLASSIFIED REPORT

ABSTRACT: (U) Abstracts are given for research efforts  
on airbreathing combustion, rocket propulsion, and  
diagnostics of reacting flows. Keywords: Shear layers,  
Turbulence, Instability, Electromagnetic propulsion,  
Plasma propulsion, Erosion, Magnetoplasmodynamic  
thrusters, Fluid dynamics, Arcjet thrust chambers,  
Electrothermal propulsion, Laser thermal propulsion,  
Electric discharges, Chemical kinetics, Nitramines,  
Nitroform compounds, Solid propellants, Acoustic flow  
fields, Solid rocket combustion chambers, Acoustic waves.  
(aw)

DESCRIPTORS: (U) \*AIR BREATHING ENGINES, \*COMBUSTION,  
\*ROCKET PROPULSION, \*THERMAL PROPULSION SYSTEMS,  
\*ELECTRIC PROPULSION, ACOUSTIC FIELDS, ACOUSTIC WAVES,  
COMBUSTION CHAMBERS, DIAGNOSIS(GENERAL), ELECTRIC  
DISCHARGES, ELECTROMAGNETIC DRIVES, EROSION, FLOW, FLUID  
DYNAMICS, LASERS, LAYERS, NITRAMINES, NITROMETHANE,  
PLASMAS(PHYSICS), PROPULSION SYSTEMS, REACTION KINETICS,  
ROCKETS, SHEAR PROPERTIES, SOLID PROPELLANTS, SOLIDS,  
THERMOELECTRICITY, TURBULENCE, ROCKET ENGINES.

IDENTIFIERS: (U) PE81102F, Magnetoplasmodynamic  
Thrusters, Electrothermal Propulsion, Laser Thermal

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PK CORP STORRS CT

(U) Random Access Transmission Algorithms for Data Local Area Networks.

TRANSMISSION SYSTEMS, \*COMPUTER NETWORKS, \*RANDOM ACCESS COMPUTER STORAGE, ALGORITHMS, ARCHITECTURE, BRIDGES, CIRCUIT INTERCONNECTIONS, CLUSTERING, CONGESTION, IMPACT, NODES, OPTIMIZATION, PACKETS, POLICIES, PREVENTION, RADIO EQUIPMENT, RELAYS, TRANSMITTANCE, WIRE.

DESCRIPTIVE NOTE: Final rept. 15 Sep 87-15 Sep 89,

IDENTIFIERS: (U) PE63222C, WUAF0SRD822F1, LAN(Local Area Networks).

OCT 89

PERSONAL AUTHORS: Papantoni-Kazakos, P.

REPORT NO. PKC-TR-89-3

CONTRACT NO. F49620-87-C-0107

PROJECT NO. D822

TASK NO. F1

MONITOR: AFOSR  
TR-89-1718

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this research is to address some of the fundamental issues that arise in the modeling, analysis and design of interconnected wire and radio Local Area Networks (LANs). In the case of wire LANs, the individual LANs are interconnected through store-and-forward devices, which relay packets between adjacent LANs and route them to their final destination. In radio networks, we are concerned with multi-hop packet radio networks that consist of a collection of interconnected local clusters; a local cluster is a single-hop network in which the (possibly mobile) users are within transmission range of each other. The local cluster interconnection is provided by relay nodes that belong to the intersection of two or more local clusters, or by special bridge nodes if local clusters are disjoint. The focus of the research is on the mutual impact of interconnection and access protocols, possible network architectures for interconnecting devices and backbone networks, routing policies, and flow and network-access control for congestion prevention and performance optimization. Keywords: Single-hop random access networks, Dynamically adaptive transmissions. (kr)

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